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ABSTRACT

The Social Issues course is designed to help students make rational and constructive decisions regarding various social and environmental problems. It is intended to be used with 10, 11, or 12th grade students. This course contains units on decision-making, urban planning, food and nutrition, environmental pollution, nuclear energy, and resource management. Each unit includes: (1) a rationale; (2) list of behavioral objectives; (3) compilation of activities (containing information on suggested grade level, learning objectives, skill areas addressed, materials needed, activity descriptions and/or worksheets, and assessment tasks); and (4) a reference list. Appendices contain a glossary of terms for action words and explanations of the basic processes of science and of integrated processes. (ML)

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COMPETENCY BASED CURRICULUM GUIDE

Science and Social Issues

SE 047 521

PUBLIC SCHOOLS OF THE DISTRICT OF COLUMBIA

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Superintendent of Schools
Chief State School Officer

1983

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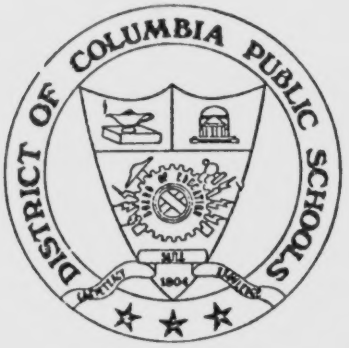

Table of Contents

SCIENCE AND SOCIAL ISSUES

Preface..... iv

Decision Making

Hierarchy..... 4
Triads..... 6
References..... 33

Urban Planning- Community Focus

Hierarchy..... 40
Triads..... 42
References..... 85

Urban Planning- Personal Focus

Hierarchy..... 91
Triads..... 94
References.....129

Food and Nutrition

Hierarchy.....134
Triads.....136
References.....172

Controlling Environmental Pollution

Hierarchy.....180
Triads.....182
References.....209

Nuclear Energy

Hierarchy.....216
Triads.....218
References.....245

Resource Management

Hierarchy.....250
Triads.....252
References.....279

Appendix

Glossary of Terms.....285
Processes (Skills) of Science.....286
Integrated Processes.....287

The science program for the D.C. Public Schools is a K-12 sequence which is designed to offer a continuous, consistent plan for helping students to acquire scientific skills and knowledge.

The K-6 levels of the science program include experience in learning the basic science skills of observing, measuring, using space/time relationships, inferring/predicting, communicating, and classifying. The content associated with the practice of each skill is designed to acquaint children with everyday phenomena in the immediate environment.

Levels 7-8 of the curriculum reinforce the basic skills and synthesize them into the more sophisticated behaviors of communicating, measuring, classifying, formulating hypotheses, identifying variables, interpreting data and experimenting.

The 9-12 sequence of the science program begins with a required science course for everyone. This requirement is met by one of two course offerings: (1) Laboratory Skills, or (2) Science for Decision Making. The laboratory skills course is designed for students who anticipate electing one or more science courses at the senior high level. It is the prerequisite course for biology, chemistry, physics and other science electives. Science for Decision Making is the ninth grade general science course which is planned to serve those students who wish to take only enough science to fulfill graduation requirements.

The Science and Social Issues course (10-12) is designed as a terminal, credit earning course for students who will not elect to take additional science courses. It has no pre-requisites. Its purpose is to help students become scientifically literate about current social issues which affect them in everyday life. Because it is laboratory oriented, it reinforces the skills of science which were learned in earlier courses.

All of the offerings in the science program are laboratory courses designed to maintain and further enhance the acquisition of the skills of communication, classification, measurement, and experimenting as they are applied to acquiring new scientific knowledge. Specific objectives for each required course and for the basic electives can be found in the CBC Scope and Sequence documents and curriculum guides for science.

SCIENCE AND SOCIAL ISSUES

PREFACE

The Social Issues course is designed to help students become scientifically literate, i.e., to enable them to make rational and constructive decisions regarding various social and environmental problems. It is further designed to make students aware of man's dual role as both creator and controller of the problems which affect his external and internal environment.

This course focuses on six issues: decision making, urban planning (community focus - personal focus), food and nutrition, environmental pollution, nuclear energy and resource management. It is required that students master decision making before proceeding to the remaining issues. It is suggested that students complete urban planning, food and nutrition before proceeding to nuclear energy and resource management.

This course is designed so that it can be offered to either 10th, 11th, or 12th grade students. It is suggested that a structured format be used with 10th grade students and a more informal (i.e., symposium, or seminar) format be used with 11th and 12th graders.

Resource materials needed by teachers and students are listed at the end of each issue. Many of the published materials are available without cost from agencies located in Washington, D.C. Teachers are urged to allow students to help in procuring these and other needed materials. Students should also be encouraged to do projects which require them to interact with local neighborhoods and communities. First hand activities not only motivate students but also enhance their civic awareness.

It is not the intent of this course to ask all of the questions or provide all of the answers. It is merely a means by which the teacher, using his/her ingenuity and creativity as a tool, can generate social awareness, critical thinking, and project production.

A C K N O W L E D G E M E N T S

The Social Issues curriculum guide has been prepared by the following teachers:

Bruce Alcan ---------- Francis Junior High School- 1979
Merle Bush ---------- Backus Junior High School - 1979
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DECISION MAKING

ISSUE: DECISION MAKING

LEVEL: 10-12

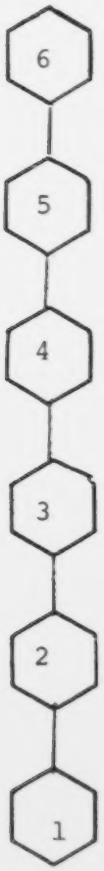
RATIONALE

In this unit, students develop learning skills and inquiry skills by studying different social issues that deal with environmental pollution, nutrition, resource management, and urban planning problems. These skills will help the students to attack the problems and make decisions when they are encountered outside of the school setting.

The objectives of this unit include the clarification of values and the development of a positive self-concept, through learning the decision making process and applying it to the solution of social problems.

Values clarification activities provide students with a means to examine, clarify, and define their attitudes or values in regard to their environment. Students consider various social dilemmas and choices that an individual can make to mitigate those crises. This unit suggests positive types of action an individual or a group might take to solve an issue and encourages students to formulate solutions of their own. The students then give reasons for their selections. By focusing on reasons for their choices, students become aware of the values and attitudes they hold.

DECISION MAKING HIERARCHY



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SCIENCE AND SOCIAL ISSUES

ISSUE: DECISION MAKING

OBJECTIVES

1. Given the thought category terms necessary for identifying the different kinds of statements that this course will concern, the student will define and give examples of fact, opinion, observation, inference, scientific and unscientific reasoning.
2. Given the following considerations about value formation, the student will independently apply these ideas to a list of value words and statements and state why the values are important or not important to him/her. (See Triad)
3. Given a list of contrasting items, the student will be able to apply the two main characteristics of values in order to identify which characteristic each example represents.
4. Given the three considerations of value formation and the two main characteristics of values, the student will rank four different social issues, (nutrition, resource management, environmental pollution and urban planning) and state why one social problem is more important than another.
5. After reading and discussing a social problem, the student will identify statements of scientific and unscientific reasoning, fact, opinion, values, observations and inferences to show that these terms are important in making decisions concerning these problems.
6. Given a problem solving model, the student will apply this model to make a decision about a social or environmental problem.

ISSUE: DECISION MAKING

LEVEL: 10-12

OBJECTIVE:

DM-1 Given the thought category terms necessary for identifying the different kinds of statements that this course will concern, the student will define and give examples of fact, opinion, observation, inference, scientific and unscientific reasoning.

SKILLS: Communication, Classification

MATERIALS NEEDED:

Pictures or Slides
Various Commerical Products
Worksheet - drawing of a house
Handout with Statements for Identification

ACTIVITIES:

1. The student will write down and discuss with the teacher the definitions of the six listed terms.
2. Conduct a Lab Activity to illustrate the terms "scientific" and "unscientific" reasoning. Have students form groups which will test the scientific validity of certain commercial products such as soap powder, paper towels, and batteries. Help them to design controlled experiments for testing at least two products.
3. Have students do an activity to review the concepts of "observation" and "inference". Have students carefully examine and look at pictures or the worksheet diagram of a house. Have students write down at least 5 observations and at least 5 inferences about the picture.
4. Conduct an activity with the students to review the concepts of "fact" and "opinion". Students will identify the kinds of statements that are listed on a handout.

   For example: 1. Ronald Reagan is President. ____ fact
   2. Pizza is bad. _____ opinion
   3. Democrats make the best mayors.___ opinion
   4. There are 60 seconds in a minute. ___ fact

Worksheet for Activity 3

Directions: Carefully examine the above picture. Write five observations and five inferences about the picture.

ASSESSMENT TASKS:

1. From memory define the following terms: fact, opinion, observation, inference, scientific reasoning, and unscientific reasoning.
2. Carefully examine the picture below and write 5 observations and 5 inferences about what you notice.

3. Match the following statements to each term, by placing the letter in Column B in the spaces in Column A.

Column A	Column B
1. ____ Washington, D.C. is the capital of the U.S.	A. Opinion
2. ____ I like the smell of roses.	B. Fact
3. ____ Ice cream is delicious.	
4. ____ There are seven days in a week.	

ISSUE: Decision Making

LEVEL: 9-10

OBJECTIVE:

DM-2 Given the following considerations about value formation, the student will independently apply these ideas to a list of value words and statements and state why the values are important or not important to him. Values are shaped by the following, usually unconscious considerations:

1. how strongly one feels about those values.
2. how consistent with one's old values are the new values being considered.
3. how strongly one's values permit one to reach for life goals.

SKILLS: Communication, Classification

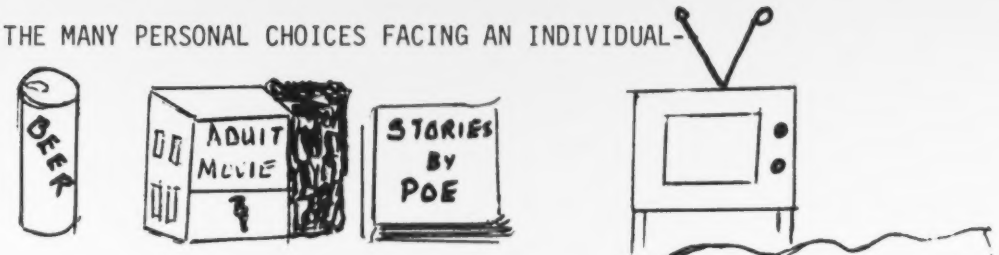
MATERIALS:

Value word list

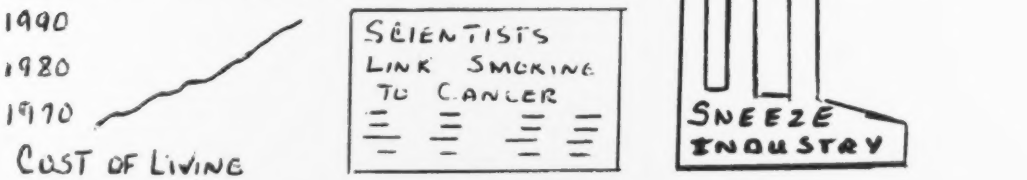
ACTIVITIES:

1. Student will compile a list of value words that combines many of the values of the class. (An example list is provided on the next page.)
2. From the value word list, the student will choose six words and state why he believes those six are the most important values. He should state his reasons in terms of both the three considerations of value-formation and his own experiences.

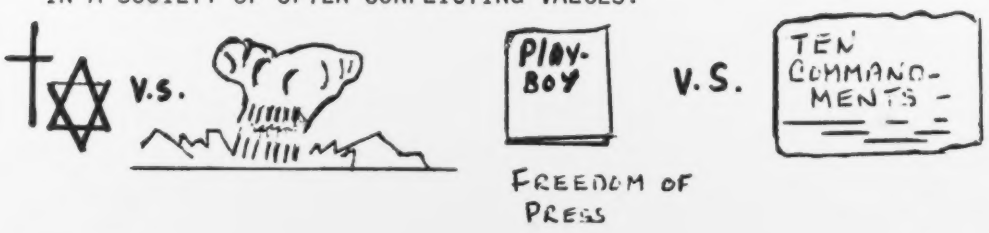
THE MANY PERSONAL CHOICES FACING AN INDIVIDUAL-



--CAN AND DO LEAD TO SOCIAL PROBLEMS.



THIS PHENOMENON OFTEN HAPPENS BECAUSE WE LIVE IN A SOCIETY OF OFTEN CONFLICTING VALUES.



ALBERT EINSTEIN ASTUTELY VIEWED THIS PHENOMENON AS, "A PERFECTION OF MEANS AND A CONFUSION OF GOALS."

DM 2

VALUE WORDS LIST

Accomplishment
Ambition
Competitiveness
Beauty
Courage
Cheerfulness
Civility
Empathy
Equality
Education
Family
Friendship
Freedom
Intelligence
Imagination
Justice
Love
Law & Order
Logic
Moderation
Modesty
Mature Love
Materialism
Nature
Personal success
Peace of mind
Fairness
Frugality
Good Health
Happiness
Honesty
Hard-working
Hope
Humor
Honor
Independence
Peace
Power
Privacy
Resourcefulness
Self-Respect
Respect for Children and Elders
Responsibility
Sensibility
Trustworthiness
Wealth
Wisdom
Wit
Quiet

Add others if you can think of some which have special value for you.

1. 3. 5.
2. 4.

ASSESSMENT TASKS

Referring to a list of value words:

1. Identify three values that you feel strongly about and state your reasons.
2. Identify three values that are new to you but that fit in well with your old values. State why the old values fit in with the new values.
3. Name three values that enhance your ability to reach your life goals and state the reasons why these three values permit you to do so.

ISSUE: DECISION MAKING

LEVEL: 10-12

OBJECTIVE:

DM-3 Given a list of contrasting items, the students will be able to apply the two main characteristics of values in order to identify which characteristic each example represents. Characteristics:

1. All values change.
2. Not all people conform to all values.

SKILLS: Communication, Classification

MATERIALS:

Pictures that show examples of changing values and non-conformity.

ACTIVITIES:

1. a) Have the class discuss the two characteristics of values. Ask them to explain what is meant by the statement "all values change." For example, as individuals age and mature their way of thinking also matures, so that the values they held at one time are later changed. Society has changed due to advancements in technology. Therefore values that persons have at one time are later changed because of the new discoveries and improvements in science.

The students should give examples with their explanation such as: a change due to maturity could be the belief that owning an expensive car means that you are a successful person and later realizing that this is not always true. A change due to advancements in technology could be the belief that washing clothes by hand is the best way to get them clean, and later realizing that using a washing machine is far superior in cleanliness and efficiency.

b) Now ask the class what is meant by the statement "Not all people conform to all values." For example, to feel that a microwave oven is necessary in order to be an efficient cook, is not a value held by most of the population. Conformity means that a large portion of the population agrees with generally accepted standards.

2. a) Give the students a list of contrasting items and have them identify which characteristic of values (1 or 2) each set represents.

   b) Have the students give a reason to support their identification.
   Example: Oil Lamp _____ Electric Lamp
   This set represents characteristic 1 - all values change. People want a more convenient, economical way of producing light and man has developed one through technology.

ASSESSMENT TASKS:

1. Identify each set of contrasting items as an example of characteristic 1 or characteristic 2 of values. Write the correct number on the line.

Contrasting Items	Characteristic of Values
1. Refrigerator Underground Storage	_____
2. Electric Typewriter - Manual Typewriter	_____
3. Telephone - Smoke Signal	_____
4. Polaroid Camera - Pinhole Camera	_____

2. a) State five examples from periodicals which indicate present day manners of eating, clothing and sheltering.
   b) Contrast these manners with older ways of eating, clothing and sheltering found in other written and photographic sources.
   c) Indicate which characteristics of values each example represents.

3. State five examples of values that have changed, and five examples of values to which individuals or minority groups have not conformed. State the best reasons why these values have changed and why all people do not conform to all values.

ISSUE: DECISION MAKING

LEVEL: 10-12

OBJECTIVE:

DM-4 Given the three considerations of value formation and the two main characteristics of values, the student will rank four different social issues, (nutrition, resource management, environmental pollution and urban planning), and state why one social problem is more important than another.

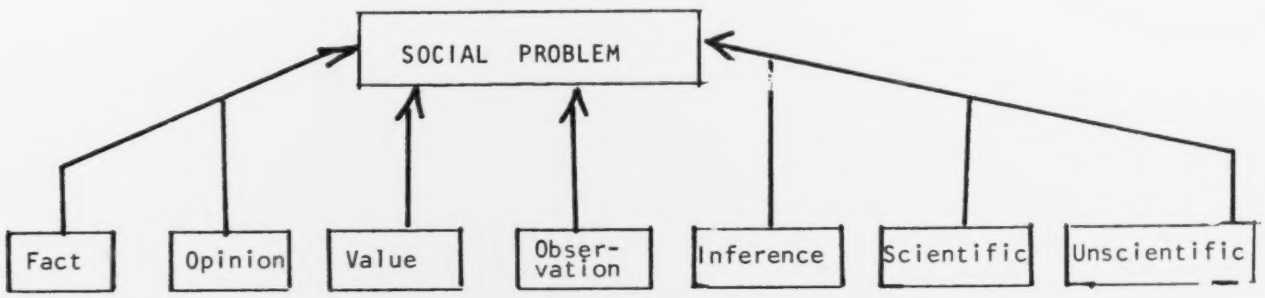
SKILLS: Communication, Classification

MATERIALS NEEDED:

Newspaper, photos and/or film slides to provoke thought on different programs concerning social problems.

ACTIVITIES:

1. Students will construct an operating definition of the term social problem. (See definitions list at the end of this issue). Have them then fill in a diagram, using the previous vocabulary, as the teacher explains how these terms are important in examining a social problem. One may use the following diagram:



2. Keeping in mind the relationship between the vocabulary terms and the way in which we examine social problems, the students will choose ten different social problems, show them to the teacher, and defend their reasons for choosing those ten as being important.

3. Students will rank examples of four different social issues - resource management, environmental pollution, urban planning, and nutrition - and give reasons for putting them in that order.

ASSESSMENT TASKS:

1. Write four examples of important social problems and explain why you consider these to be important.

2. Write four examples of social issues which are part of the issues in this course- pollution, energy, nutrition, and urban problems- and explain why these examples are important issues.

3. Rank the four social issues, in question two, and explain why one is more important than the other in terms of the three considerations of value formation. (See DM-2 for the three considerations).

ISSUE: DECISION MAKING

LEVEL: 10-12

OBJECTIVE:

DM-5 After reading and discussing a social problem, the student will identify statements of scientific and unscientific reasoning, fact, opinion, values, observations and inferences to show that these terms are important in making decisions, concerning these problems.

SKILLS: Communication, Classification

MATERIALS NEEDED:

Various exerpts concerning social problems from magazine articles or newspaper stories.

ACTIVITIES:

1. Students will construct a definition of the term decision making. Have students discuss and give examples of decision making.
2. Given a selected reading concerning any social problem, the student will identify the kind of statements that are found in the passage: scientific and unscientific, fact, opinion, value, observation and inference.
3. Students will make a decision as to the solution of this social problem based on the information collected in activity 2.

ASSESSMENT TASKS:

1. Identify three examples of scientifically reasonable statements or paragraphs from a story that is related to one of the five topics of this course: urban planning, food and nutrition, resource management, nuclear energy, and environmental pollution. Recommended: Article on 3-Mile Island Incident, Newsweek Magazine - April 9, 1979.

2. Identify three examples of value - laden statements or paragraphs from the same reading which are related to the previously mentioned topics.

3. Choose three examples of inference statements or paragraphs from the same reading material previously suggested, and identify the relationships between scientifically reasonable statements and values, as they lead one to make a decision on a social problem.

SCIENCE AND SOCIAL ISSUES

ISSUE: DECISION MAKING

LEVEL: 10-12

OBJECTIVE:

DM-6 Given a problem solving model, the student will apply this model to make a decision about a social or environmental problem.

SKILLS: Communicating, Collecting data

MATERIALS:

Handouts: Diagram of Problem Solving Model *
"Time is Scarce for Gary"
Folders, news articles

ACTIVITIES:

1. Give the students the diagram of the problem solving model. Explain the components of this model to the class.

Note to the Teacher:

There are three basic steps in the problem-solving model, the organizing strategy designed to help students look at local social problems. An outline representation of the model looks like this:

A. Define the problem
   1. What's going on?
   2. Impact- good and bad?
   3. How pressing?
B. Proposed Solutions
C. Find the Most Appropriate solution
   1. Impact- good and bad?
   2. Can the solution be put into effect?
   3. Is the solution in time?

A graphic representation of the problem-solving model is presented on the following page.

(* The model is taken from Project C.R.E.A.T.I.O.N., National Diffusion Network, LaSalle-Peru School District, LaSalle, Ill.)

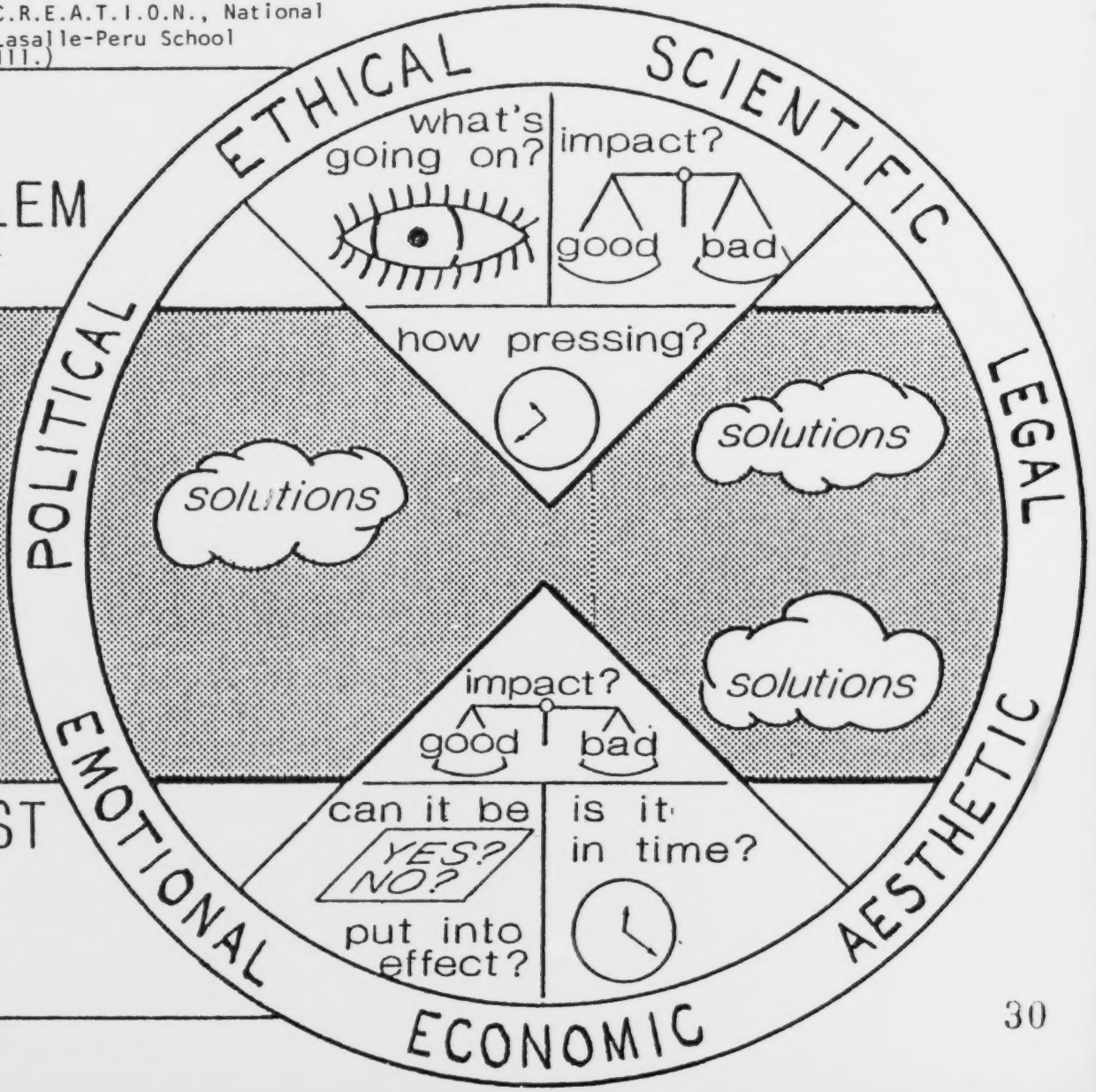
THE CREATION PROBLEM-SOLVING MODEL*

(Taken from Project C.R.E.A.T.I.O.N., National Diffusion Network, Lasalle-Peru School District, LaSalle, Ill.)

1. DEFINE PROBLEM

2. *PROPOSE SOLUTIONS*

3. FIND THE MOST APPROPRIATE SOLUTION



Give the students the selection "Time is Scarce for Gary." Conduct a classroom discussion in which the students answer the following questions.

1. What problem is facing Gary and why?
2. What reasons are there for Gary to stay in school?
3. What reasons are there for Gary to get a job?
4. How pressing is this problem for Gary and why?

Apply these questions to the first component of the problem solving model.

Note to Teacher:

Question 1 - (A 1)

Questions 2 & 3 - (B 1)

Question 4 - (C 1)

Divide the class into small groups. Have each group construct one solution for the problem. Have each group present its solution to the class. Conduct a classroom discussion in which you test each solution according to the criteria established in Part C of the problem solving model. Based on this discussion, have the class determine which is the most appropriate solution to this problem.

"TIME IS SCARCE FOR GARY"

Gary Ward was sick of school - tired of English grammar and American history. He felt he had learned all he needed from school. Now he was sixteen and had better things to do. Gary was also tired of never having enough money to spend on a date and not having a car. He had a driver's license, but what good was it without a car? Besides, his parents had trouble feeding and clothing their children on their income. If Gary worked, he could help out at home.

FACED WITH A CHOICE

There was no sense in quitting school unless he had a job, of course. An opportunity did come up, however. A gas station attendant had quit at Larry's Super Service, and Larry offered Gary the job. At $2.75 an hour, he could make about $100 a week.

When Gary told his family he wanted to drop out, they were upset. No one in the family had ever finished high school. Gary's father told him about the troubles he had in finding a good job because he did not have a high school diploma. He wanted Gary to do better.

Gary was not sure. He went to talk to Jim Jackson down at the neighborhood community center. Jim did not hassle him like most other adults and Gary felt he could trust him.

"Here is the problem," Gary stated. "I have got a good job offer and plenty of things to do with the cash I can earn. School is not doing me any good anyway."

"Have you thought about your life ten years from now?", Jim asked. "School might help you get a better job than pumping gas." Gary shrugged. "Most jobs are the same." Besides, if I stay there long enough, I can work on cars and maybe become a mechanic. You know, even if I get a better job after going to school longer, I will still come out behind. Look at all the money I would lose by not making my hundred a week.

SOME FACTS TO THINK ABOUT

Jim thumbed through his file cabinet and pulled out a batch of clippings. "Here are some figures I cut out of a magazine." It says drop-outs are twice as likely not to get a job as high school graduates. "Of course, you will have a job for now. But as you get older, you are less likely to get or keep a job if you do not have a diploma."

"And here is another fact," Jim said. The average high school graduate's lifetime earnings are $90,000 more than the non-graduate. The magazine also says that things will get worse if you do not finish high school. Many jobs that unskilled people now hold are going to be done by machines. More of the available jobs will take more education."

"I can not worry about the future." Gary answered. "For me, the future is now. I need money, and I am tired of school. Besides, I have never seen a gas pump that would fill up a car, check the oil, and collect the bill.

Gary told Jim about an article he had read. It talked about some drop-outs who had become millionaires. I am going to get an early start at learning the gas

station business. I bet I will own a station by the time I am twenty-five. Who knows, I might even own a string of them."

They talked some more, and Gary thanked Jim for his advice. He promised to think about it. Staying in school had its advantages and disadvantages. So did dropping out. It was not an easy decision.

2. a) Have the students identify one social or environmental problem within the school. Using the problem solving model and following the format in activity one, have the class work through this problem to determine the most appropriate solution.

   b) Have the students bring to class as many articles as they can find on social and environmental problems. Place all articles pertaining to the same issues in folders and label these folders. Make a listing on the blackboard of the issues addressed in these news articles. Divide the class into small groups. Have each group select one environmental or social issue. Give each group the folder pertaining to its selected topic. Using the reference material in the folder, have each group define its problem and work through the problem solving process to determine the most appropriate solution to this problem. Have each group make a presentation to the class.

ASSESSMENT TASKS:

1. Complete the given problem solving model to determine the most appropriate solution for the issue described below.

   A city park used by the students to play basketball, football, jog, and swim is the object of interest by a company that specializes in hiring students from the neighborhood for summer and permanent work. How could the students protect the park from being sold to the company?

2. Complete the given problem solving model to determine the most appropriate solution for the issue described below.

   The D.C. government has discovered that a favorite disco radio station of students has been emitting such powerful radio signals that people in the community, including students, have been experiencing skin irritations, skin sores, and eye and ear problems. The radio station admits responsibility, but says that it cannot lower the rate of the radio signals transmitted. What could the government do?

3. Complete the given problem solving model to determine the most appropriate solution for the issue described below.

   All of the students in the class have parents that work in a company that manufactures chemicals. The chemical company has been polluting the Potomac River and has broken the anti-pollution laws for so long that the Environmental Protection Agency will soon force the closing of the company. If the chemical company stops polluting the water, it will be allowed to remain in business, but it will be forced to fire almost half of its employees. What should the company do?

   Note to the teacher: Problem solving model is on the next page.

PROBLEM SOLVING MODEL

Name _____ Date _____

I. Define the problem

A. What's going on? _____

_____

_____

B. Impact (Describe tne impact on any three of the following: Aesthetic, scientific, legal, economic, ethical, emotional, political)

1.

2.

3.

C. How pressing? _____

_____

_____

II. Proposed Solutions (3)

1.

2.

3.

III. Find the most appropriate solution.

A. Solution one

1) Impact (describe) good or bad

2) Can the solution be put into effect? (Explain)

3) Is the solution in time?

B. Solution two

1) Impact (describe) good or bad

2) Can the solution be put into effect? (Explain)

3) Is the solution in time?

C. Solution three

1) Impact (describe) good or bad

2) Can the solution be put into effect? (Explain)

3) Is the solution in time?

Which one of your three solutions is the most appropriate?

_____

_____

_____

SCIENCE AND SOCIAL ISSUES

ISSUE: Decision Making

LEVEL: 10-12

Definition of Terms

1.	FACT:	That which is proven to be true through the human senses.
2.	INFERENCE:	That which is found out by reasoning.
3.	OBSERVATION:	A true statement that is based on the human senses.
4.	OPINION:	That which one thinks about a situation.
5.	VALUE:	That of which we think highly. A belief or attitude that leads to judgment or action.
6.	SCIENTIFIC:	A thought process that involves applying the facts and laws of science to the solving of everyday problems.
7.	UNSCIENTIFIC:	That which is not in accordance with the facts and principles of science.
8.	DECISION-MAKING:	A thought process that involves reaching a judgment.
9.	SOCIAL PROBLEM:	An issue or crisis that affects a large number of people and causes individuals to make judgments or take actions to alleviate the problem.

A REFERENCE LIST FOR DECISION-MAKING

PHYSICAL SCIENCE: SOCIAL ISSUES

OBJECTIVE:

DM-1: A good introduction piece to interest students, concerning science and social issues, would be the movie, "A Question of Values" from the U. S. Environmental Protection Agency Office of Public Awareness, Fourth and M Streets, S. E., Washington, D. C.*

A related article for students to read would be "Refinery Resisted," Washington Post, page 1, July 16, 1979. Many social issues (problem) examples may be found in a wide selection of stories, films, and libraries throughout the District of Columbia.

DM-2: "Social Readjustment Rating Scale," Journal Psychosomatic Research, 1967, pp. 213-218.

Hunt, Maurice and Lawrence Metcalf. Teaching High School Social Studies. Harper and Rowe Publishers, 1968.

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*The movie, "A Question of Values," is a very comprehensive film that introduces the concepts of environmental pollution, resource management, values, decision-making, social class and political systems, and debating social issues that interrelate. So, this movie is highly recommended. If one cannot borrow this movie from EPA, then it should be obtainable from New Film Company, Inc., phone: 617-261-3046, 331 Newbury Street, Boston, Massachusetts 02115. The film is sound/color/lasts about 30 minutes. The rental cost for the movie is $35. A print copy may be bought for $350.

Alden, Raymond A., The Art of Debate, West Publishers, n.d.

Summers, Harrison, How to Debate, 3rd edition, Wilson Publishers, n.d.

Other materials available from the Educational Media Center, 1709 Third Street, N. E. Washington, D. C. 20002:

FILMS: "Decisions-Decisions"
"Moment of Decision"
"Right or Wrong - Making Decisions"

"Atlantic Classroom Notes," Education Department The Atlantic, Eight Arlington Street, Boston Massachusetts 02116.

"SCORPIO," U.S. Library of Congress Data Reference Computer System.

"EIES," Electronic Information Exchange System, 323 High Street, Newark, New Jersey.

RESOURCE CENTERS:

Second Genesis, Ruth Caanaugh, 1201 Prince Street, Alexandria, Virginia, Telephone: 548-0442.

National Science Teachers Association, 1742 Connecticut Avenue, N. W.; Washington, D. C. 20009.

U.S. Environmental Protection Agency, Office of Public Awareness, Mittie Montgomery, Fourth and M Streets, S.E., Washington, D.C.

Holland, James D. and Roy W. Trueblood. Human Potential Seminar Participants Workbook. Kendall College Press, n.d.

Raths, Louis E., Merrill Harmin and Sidney B. Simon. Values and Teaching. Charles E. Merrill Publishers, 1966.

Luperko, Douglas. Values Education Sourcebook. Social Science Education Consortium, 1976.

Nelson, Jack L. Introduction to Value Inquiry Hayden Book Company, n.d.

"Children and Values: A Guide for Parents and Teachers," National Congress of Parents and Teachers, n.d.

DM-3, 4, and 5: Refer to DM-1, and to:

Brevnon, Matthew J. (Director). Teachers' Curriculum Guide to Conservation Education. The Pinchot Institute, n.d.

"Outdoor Classroom and Camping," Department of Education, State of South Carolina, 1968-69.

DM-6: A comprehensive book for the teacher to refer to, to enchance her perception of the relationship of science and social issues to decision-making: Commoner, Barry. The Closing Circle. Bantam Books, 1974.

Morton, John S. and Ronald Rezny. Consumer Action, Boston: Houghton Miflin Co., 1978.

Churchill and Churchill: Enriched Social Studies Teaching Through the use of Games and Activities. Belmont, California: Fearon Publishers, 1973.

URBAN PLANNING

COMMUNITY FOCUS

SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING

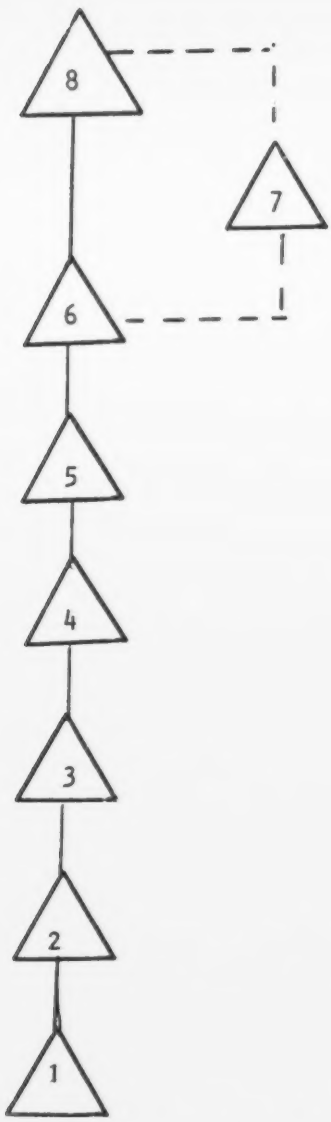
LEVEL: 10-12

RATIONALE

Today 75% of all Americans live in urban areas. As our population increases new cities will be built and existing cities will become more congested. It is, therefore, important for students to be made aware of of the problems that cities encounter as they attempt to perform and control their functions in respect to land use, housing, transportation, pollution control, health, crime, etc. It is also important for students to understand the impact that these problems have on individuals who live within these areas.

This unit is divided into two sections. Section one, community focus, examines the problems encountered in urban areas and the strategies used to solve these problems. Section two examines the impact that urban living has on the individual. It is suggested that the students complete section one before proceeding to section two.

URBAN PLANNING/COMMUNITY FOCUS HIERARCHY



SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

OBJECTIVES

1. The students will be able to describe five examples which show how the factors in an urban environment influence one another.
2. The students will be able to identify five ways that land is used in urban areas.
3. The students will be able to construct a plan which regulates land use in urban areas.
4. The students will be able to describe the transportation system found in their community, according to these main features: travel paths, vehicles, and terminal facilities.
5. The students will be able to describe how transportation related problems influence the health of the people in a community.
6. The students will be able to describe five methods that can be used to solve transportation problems.
7. The students will be able to describe the history, effects, and strategies used for solving a current urban planning issue in D.C.
8. Given the information and experiences incorporated in this unit, the students will be able to construct a model or detailed drawing of an ecologically balanced city.

SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 1 The students will be able to describe five examples which show how the factors in an urban environment influence one another.

SKILL: COMMUNICATING

MATERIALS:

Film - "Neighborhoods Are Different"

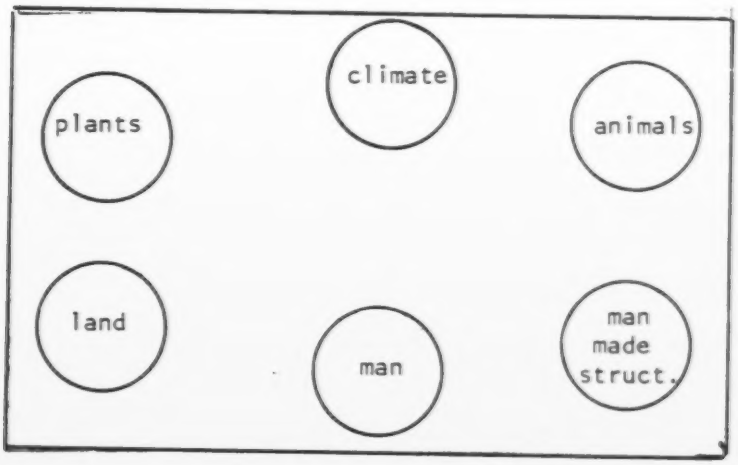
Available: Media Center; Cat. #307-1600 C

ACTIVITIES:

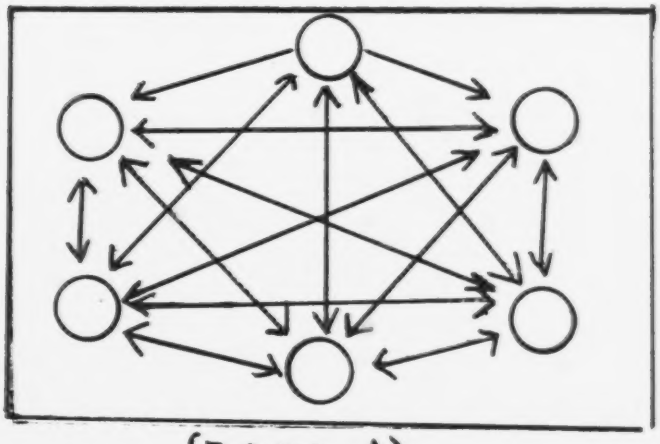
1. Define the terms urban, rural and environment. Ask the students to name areas in the United States which they have visited and consider urban areas. Show the film "Neighborhoods Are Different." Use the questions below to conduct a classroom discussion so that students can conceptualize the term urban.

    1. How does an urban area differ from a rural area? In life style? In community services? In physical environment?
    2. What kind of life styles would you expect to find in an urban area?
    3. What would you find in an urban area that you wouldn't find in a rural area? Life styles? Community services? Physical environment?
    4. What kind of area do you live in?

2. Construct a definition of urban environment. Explain to the students that an environment is a system in which many parts work together. Compare this to the automobile in which many parts (i.e., engine, brakes, electrical system, etc.) work together to make the car operate. Tell the students that some of the factors found in an urban environment are: man, man-made structures, land, planets, animals, climate. Distinguish between those factors which are man made and those which are part of the natural environment. Place the following diagram on the blackboard.



Conduct a classroom discussion from which you construct a diagram (see Figure 1) which illustrates how these factors are interrelated.



(FIGURE 1)

Note to the Teacher:
The following are examples of questions that can be used to develop the classroom discussion. You may think of many more.

1. Does man control the types of structures he builds in his environment? Give examples.
2. How can these structures affect man? Give examples.
3. Can man change the land patterns in his environment? How?
4. How does land have an affect on man?
5. Do plants and animals need one another? Why?
6. Do tall buildings make an area hotter or colder?
7. Does climate determine the types of plants and animals there are in a given environment? Explain.
8. Does the climate influence the way you dress and the way you feel?
9. When man builds his structures, what happens to the plant and animal life in the area?
10. What roles do plants and animals play in man's life.

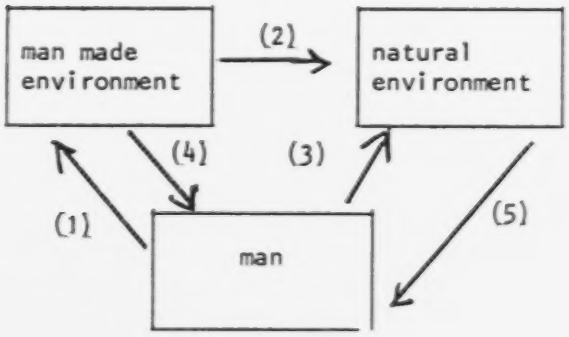
Note: A unit on ecosystems can be found in the 8th grade science curriculum.

ASSESSMENT TASKS:

1. Give an example which describes how the factor in box A has an influence on the factor(s) in box B.

	(A)	(B)
a.	man	man made structures
b.	land	man made structures
c.	man made structures	land
d.	man made structures	plants & animals
e.	man made structures	man

2. Look at the diagram below. Describe how each factor affects the other as indicated by the arrow.



3. List the factors of an urban environment and describe five examples which show how one factor has an influence on another factor.

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 2 The students will be able to identify five ways that land is used in urban areas.

SKILL: COMMUNICATING

ACTIVITIES:

1a. Refer the students to the ecosystem diagram in Objective 1 to remind students that land is a factor in the urban environment. Explain to the students that in an urban environment land is used for many purposes. Have the students draw maps of their neighborhoods (limit the neighborhood to four square blocks) indicating stores, schools, apartment buildings, single family homes, industries, playgrounds, office buildings, hospitals, parks, police stations, fire departments, parking lots, waste storage, etc.

1b. Conduct a classroom discussion from which you develop major categories of land use and examples under each category.

Note to the Teacher:
Uses may include commercial, industrial, residential, recreational, public service, transportation, waste storage, parks, institutional, etc.

2. Develop a land use color code and have the students color in their neighborhood map according to the land use found in the neighborhood.

ASSESSMENT TASKS:

1. Identify the type of land use in each example below:
    a. movies, theaters, hotels
    b. parking lots, airports, bus terminals
    c. playgrounds, swimming pools, tennis courts
    d. hospitals, fire departments, utilities
    e. row houses, high-rise apartments, single family homes

2. Identify five uses of land in your community and give an example of each.

3. Identify five uses of land in the picture shown.

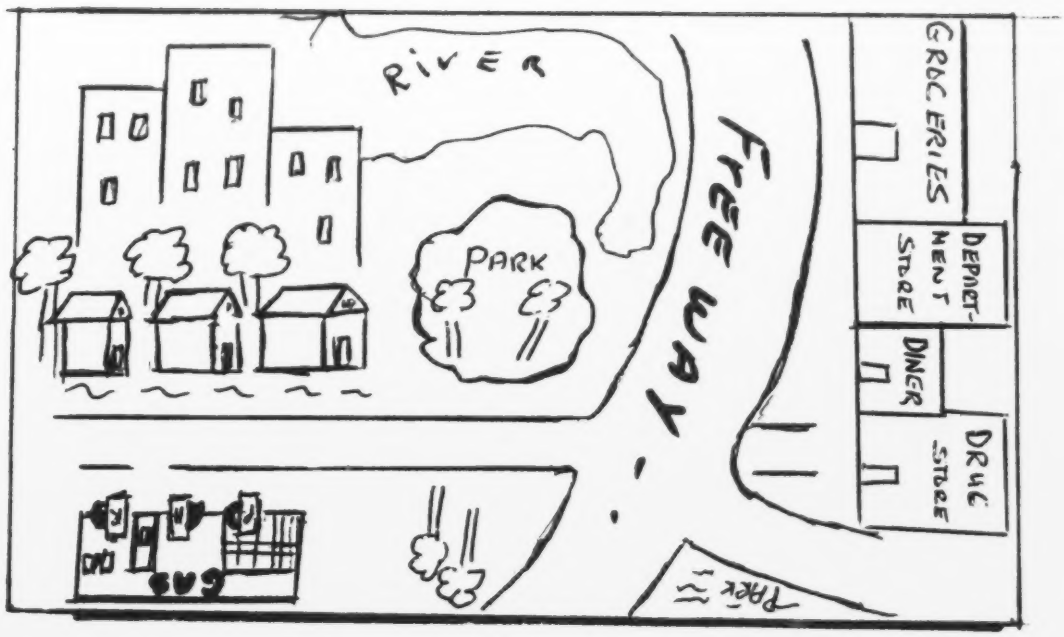
a.

b.

c.

d.

e.



SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 3 The students will be able to construct a plan which will regulate land use in an urban area.

SKILL: Formulating Hypotheses

MATERIALS:

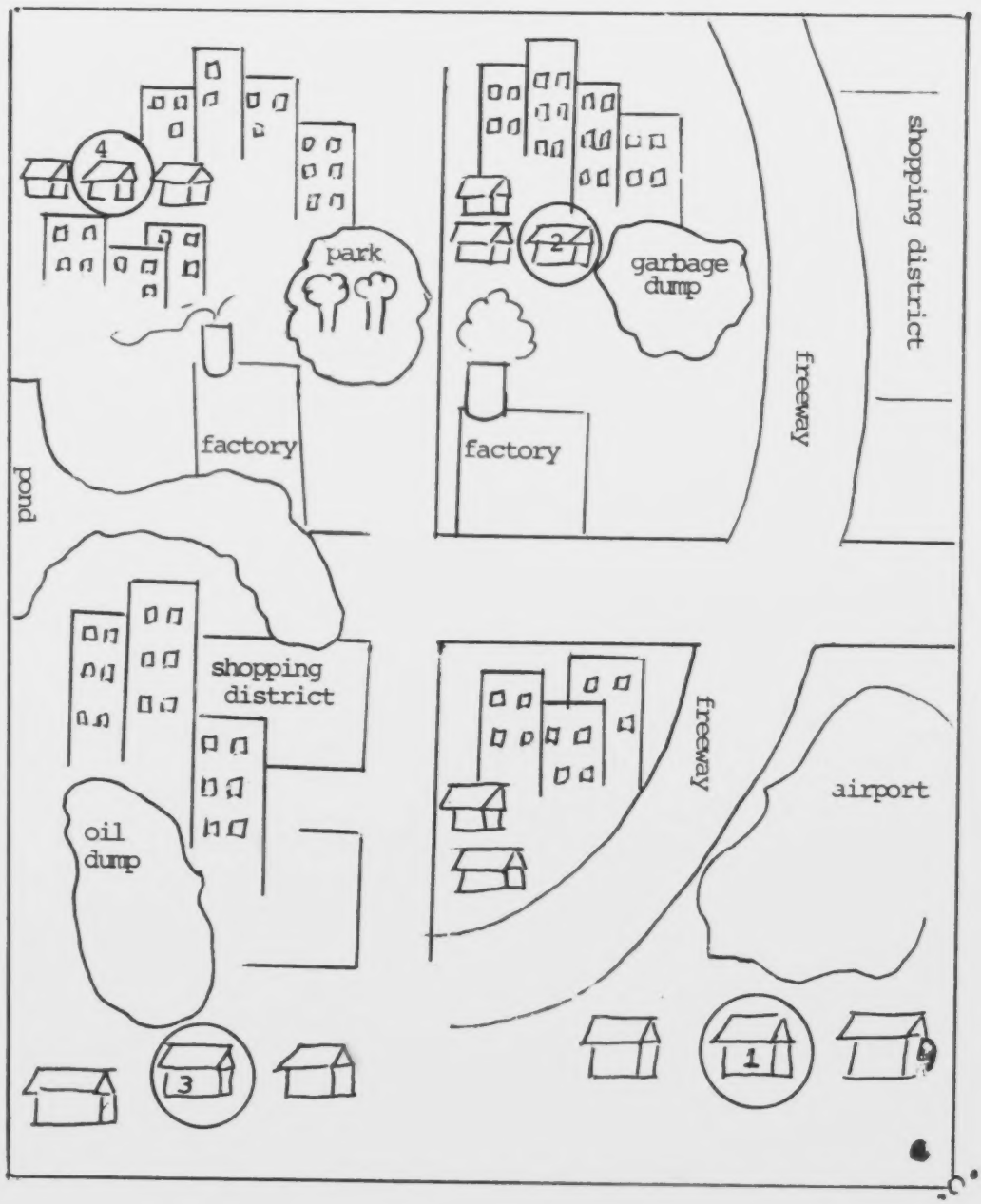
Handouts: "The Unplanned City"; "A Zoning Map"; "The Planned Unit Development"; D.C. Zoning Regulations

Zoning Regulations available from The District Building, 14th & Pennsylvania Avenue, N.W. Rm. 17, 727-5090

ACTIVITIES:

1a. Give the students the handout, "The Unplanned City." Conduct a classroom discussion using the questions below to determine what problems could arise from living in the type of city in the diagram. From this discussion, compile a master list of problems that occur when land is used unwisely.

THE UNPLANNED CITY



1. Is there adequate open space available to you in this city?
2. What effect would this have on people living in this city?
3. Are there adequate recreational facilities in this city?
4. What affect would this have on people living in this city?
5. What problems would you have if you lived in: House #1?, House #2?, House #3, House #4?
6. Are there fire hazards in this city? Explain.
7. Are there pollution hazards in this city? Explain.
8. Are there safety hazards in this city?
9. Would living in this city create stress? Why?
10. If the pond was filled in to provide land for a new housing development, what would happen to the food webs dependent on the pond environment?
11. How would this upset the ecology of the urban environment?
12. Would you want to live in this city?

1b. Refer the students to the neighborhood map which they drew in Objective 2. Conduct a classroom discussion in which the students point out the land uses in their neighborhood environment which could present problems to the community (i.e., erosion, pollution, etc.)

2a. Explain to the students that city planners try to control the unwise use of land in many ways. Introduce the term zoning as one means of controlling land use.

Zoning - A legislative method of controlling land use through the establishment of requirements and regulations.

Have the class obtain several copies of D.C. zoning regulations. Divide the class into three groups. Give each group the task of finding ten regulations or standards which fit one of the categories below:

A. Regulations to reduce and control environmental pollution
B. Regulations to reduce fire hazards
C. Regulations to reduce health hazards
    1) controlling congestion in housing
    2) controlling population density
    3) controlling open space area

Conduct a classroom discussion in which each group reports. From this discussion, compile a list of ways that the District of Columbia government controls the unwise use of land through zoning.

2b. Give the students the handout "A Zoning Map". Discuss the zoning map with the class. Divide the class into groups. Refer the students to the handout "The Unplanned City" and have each group do the following:

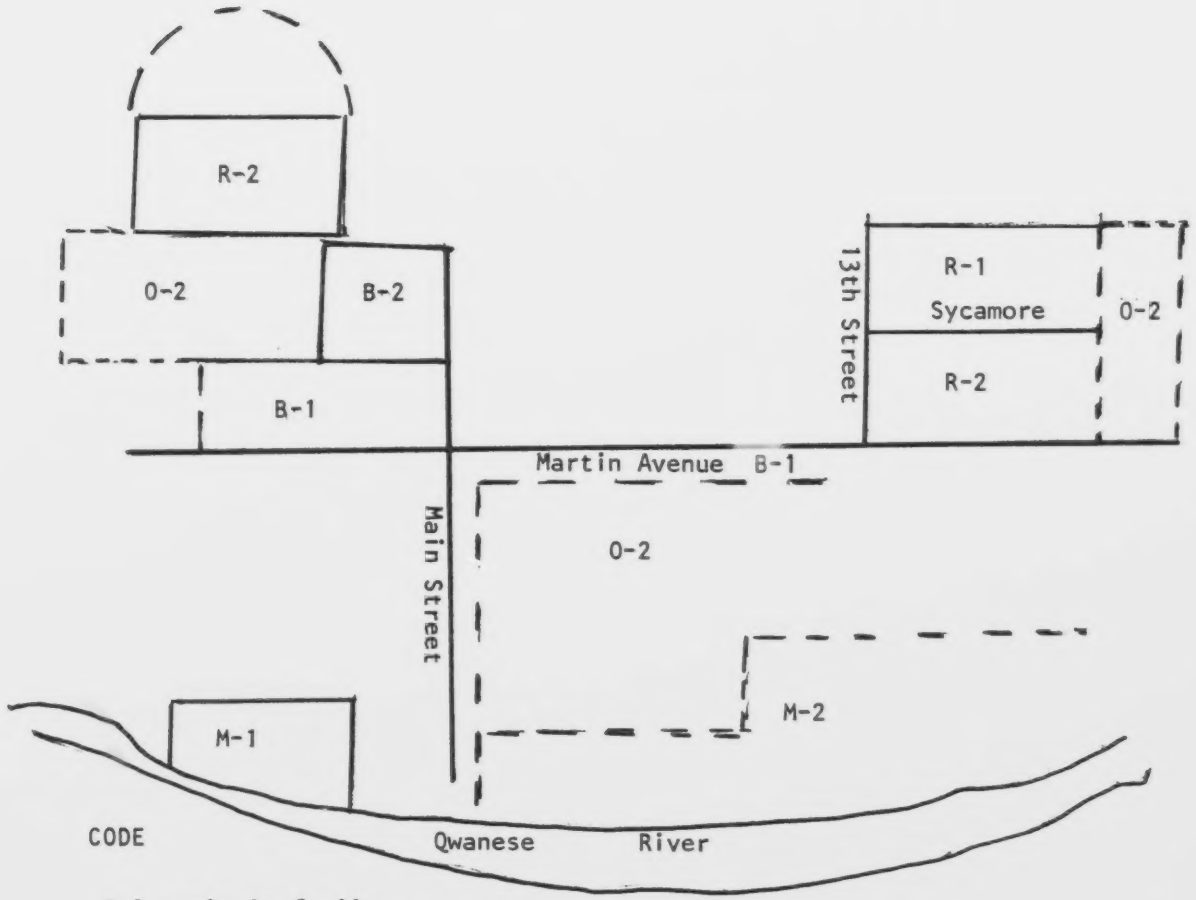
A. Develop a set of zoning standards for the unplanned city.

B. Construct a zoning map based on these standards which would reduce health, environmental, and fire hazards in the unplanned city.

Have each group present its plan and conduct a classroom discussion to evaluate each plan.

STUDENT HANDOUT - A ZONING MAP

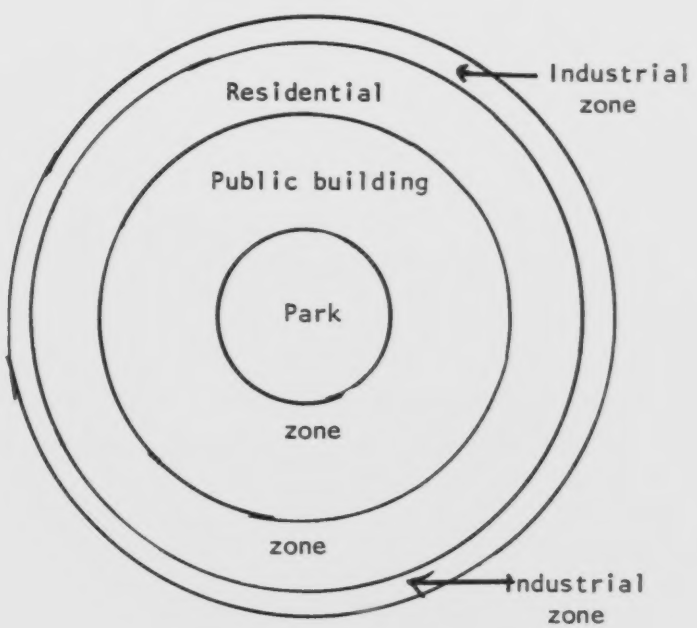
Name _____



R-1 - single family
R-2 - multiple dwelling (apartment buildings - medium-rise)
B-1 - shopping area
B-2 - commerical (hotels, motels, entertainment)
M-1 - heavy manufacturing
M-2 - light manufacturing
O-1 - recreation areas (i.e., golf course)
O-2 - parks

3a. Explain to the students that one way to control the use of land is by designating given land sites as green space or open space areas. Have students discuss what happens to people, living closely together, who are not given adequate space. Introduce the planned unit development (PUD) as a means of allowing the maximum amount of open space for people living in clustered high density housing. Give the the students the handout "The Pud Concept" and have the students compare the two diagrams. Have the students design an alternate Pud Plan diagram and display these to the class.

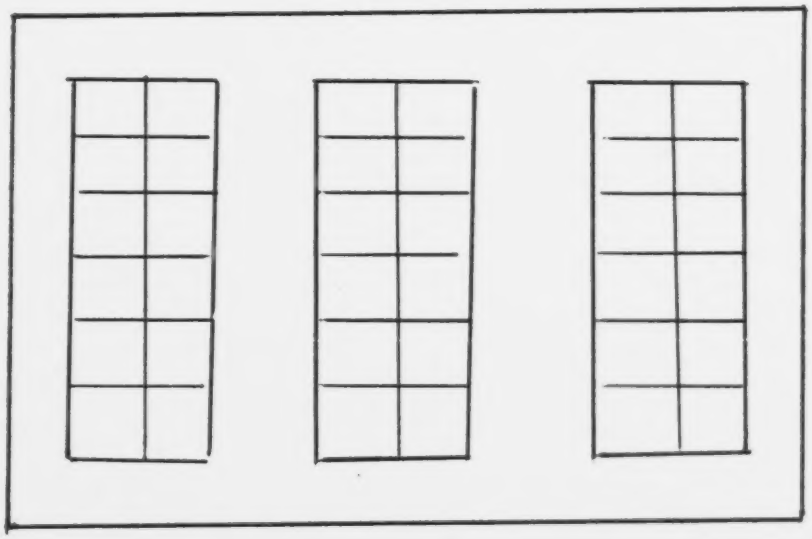
3b. Introduce the concept of greenbelts and greenspaces to control land use zones. Draw the diagram below on the blackboard and discuss how this concept prevents the formation of a "concrete jungle," allows for adequate open space and prevents cities from growing together by limiting city sprawl.



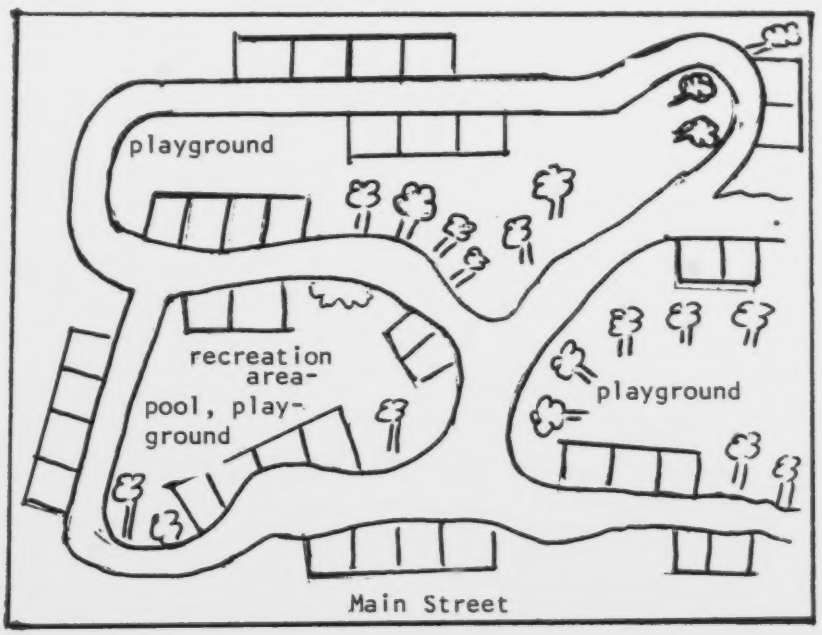
GREENBELTS

THE PLANNED UNIT DEVELOPMENT (PUD)

Name _____



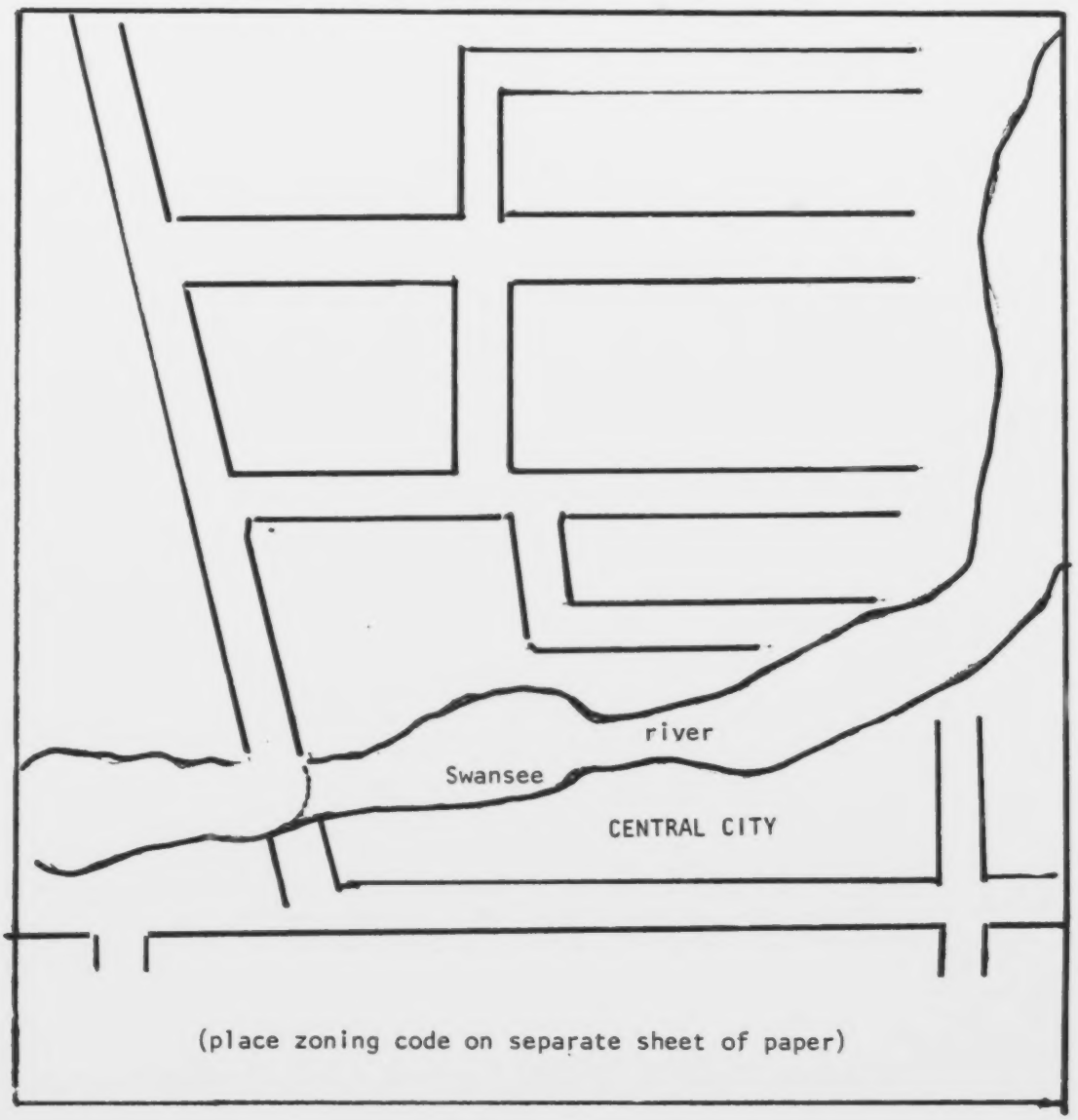
A. 36 units.. no open space



B. 36 units (PUD)... adequate open space

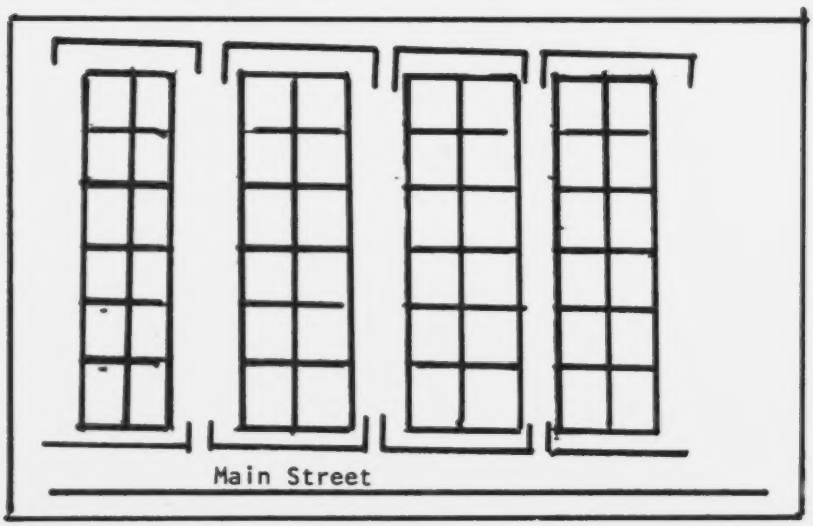
ASSESSMENT TASKS:

1. In Central City there are three industries, one of which empties into Swansee River, two shopping areas, two parks, three playground areas, four redidential districts with highrise apartments, three residential districts with single family homes, three commercial areas with hotels, motels and entertainment areas, one oil storage area, one waste disposal area (garbage dump), and one commercial area with office buildings. Use the diagram below and construct a zoning plan which would regulate the use of land in this urban area.



(place zoning code on separate sheet of paper)

2. The Happy Hollow complex is located in Central City. This complex consists of forty-eight housing units arranged as shown in the diagram below. Construct a plan which would allow for more open space (trees, recreation area, etc.) in this urban area.



3. City Light City is made up of many districts. There is a residential district, a central business district, a commercial district and an outer industrial district. The city planners want to prevent these districts from running together as well as control the city sprawl. Construct a plan which would regulate the use of land in this urban area.

SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 4 The students will be able to describe the transportation system found in their community, according to three main features: travel paths, vehicles, and terminal facilities.

SKILLS: Classification, Communication, Collecting data

MATERIALS:

-Map of the United States

-Worksheet on Vehicles

-Reference Book: Andrews, William A. A Guide to Urban Studies. Canada, Prentice-Hall 1976.

ACTIVITIES:

I. Travel Paths

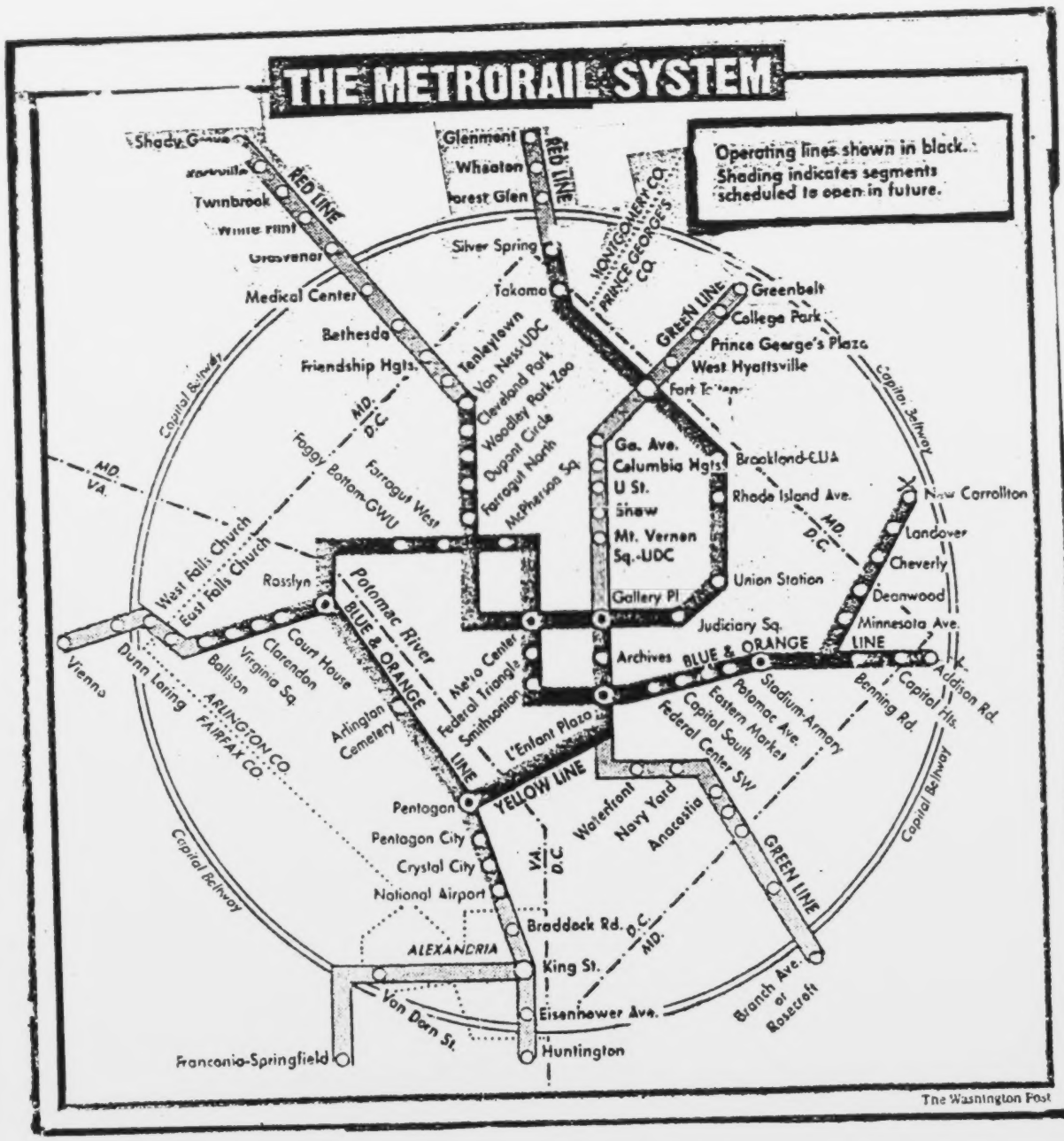
1. a) Lead the class in a discussion of the meaning of the term "travel paths." Travel paths are the structural parts of the community such as freeways (beltways), main streets, side streets, and mass-transit rights-of-way.

b) Have students list some of the main travel paths used in their community.

c) Have the students construct a labeled diagram of the travel paths found in their immediate neighborhood.

d) Using the Capital Centre in Largo, Maryland as the destination, have the students construct a labeled diagram showing the travel paths encountered when going there from home by car. Then have the students construct a labeled diagram showing the travel paths encountered when going to the Capital Centre from home using the metrobus and metrorail. Have the class discuss which travel pattern is most efficient and most convienent.

2. Using provided resources, have students classify their list of travel paths (from activity one) according to the types of roads i.e., freeway, arterial, collector or local. (Typical Standards for Classifying Roads p. 72, A Guide to Urban Studies)



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II. Vehicles

1. There are many different types of vehicles used daily for transportation. Have the class investigate the types and numbers of vehicles that pass by the school during a given period of time (for example, 15 minutes) on any given day. Make arrangements to take the class outside for this activity. The students can make data sheets on which to record their observations. (See sample.) Divide the class into groups, each being responsible for counting one type of vehicle. Compile group results and have the students answer the summary questions on their worksheet. The students can also make a line or bar graph of their data.

Sample Worksheet - Activity 1 Vehicles

Date: Travel Path:

Time Period: (15 minutes, 20 minutes, etc.)

Type of Vehicle	Total Number of Vehicles Observed
Automobile	
Bus	
Truck	
Motorcycle/Moped	
Bicycle	

Summary Questions:

1. Which type of vehicle was observed most frequently during the 15 minute time period?
2. Why do you think that this type of vehicle was observed most frequently?
3. If you repeated this activity at a different time of day, do you think that you would obtain the same results? Explain your answer.

2. a) Have students conduct a survey of their family members concerning what types of vehicles are used for their travel, during a given week. Keep a log of the family members travel.

Sample Data Table:

Family Members	Type of Vehicle	Travel Use	Difficulties Encountered
Mother	Bus	Work	

b) Have students share their information with the class by giving an oral report and by writing a paragraph explaining their findings.

c) Have the students decide how important were factors such as: speed, convenience, length of trip and safety, in the selection of the type of vehicle used during this week?

d) Ask students to propose ways in which the number of vehicles used per week could be reduced, thereby saving energy.

3. a) Students can investigate the cost per person, for one week, in traveling from home to school using different types of vehicles: for example, bus, one passenger car, car pool, subway, taxi, motorcycle. Have students discuss the information they collected with the class.

b) Have the class propose which mode of travel is most economical for a secondary student, a married worker, a single worker, and a retired person.

III. Terminal Facilities

1. Have the class discuss the meaning of the term "terminal facilities." Terminal facilities are stations, car barns, or parking areas that are needed to handle incoming or outgoing people and/or vehicles at the beginning or end of a trip.

2. Have the students investigate the location of metro stations, car barns (buses) and major parking areas found in their community. Construct a map or chart showing the location of these facilities. Questions for discussion.
   a) How does the public use each of these facilities?
   b) Is this facility convenient to the transportation system? (bus, subway) Explain your answer.
   c) Is the size of this facility adequate for the number of persons using it daily? Explain your answer.

ASSESSMENT TASKS:

1. a) Construct a paragraph describing the travel paths found in your neighborhood or the neighborhood of the school.
   b) Draw and label a picture showing these travel paths.
2. Explain what types of vehicles are used most often by the members of your family, when traveling around the city.
3. Give two reasons why terminal facilities are very important for a transportation system.

SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 5 The students will be able to describe how transportation related problems influence the health of the people in a community.

SKILL: Communicating, Collecting data

MATERIALS:

-References on the Effects of Air and Noise Pollution on People
-Time-table schedules for Bus, Subway or Train
-References on Hypertension and Stress

ACTIVITIES:

1. Lead the class in a discussion of transportation system-related problems in the community. Consider, for example, traffic congestion, irregular time schedule, equipment break-down, overcrowdedness, air pollution and noise pollution.

2. Traffic congestion causes air pollution and noise pollution.
   a) During the congestion, gases from vehicle exhaust systems build up or concentrate in a given area. Have students investigate the types of gases that are emitted and describe their harmful effects on people. For example: Sulfur dioxide can cause breathing problems. Carbon monoxide can cause headaches, nausea, convulsions, and death.
   b) During the congestion, an abnormal amount of noise is generated from the vehicles in a given area. Have students investigate the harmful effects of noise on people. For example: prolonged noise above 85 decibels can cause a hearing loss.

3. Irregular time schedules and equipment breakdown can cause undue stress on the passengers.
   a) Have students select the time-table schedule of one bus, subway or train route. Then let them construct a worst-case scenario of the effect on the passengers of a 15 minute irregularity in this time schedule.
   b) Role play the situation of a student, on his way to school, encountering a 15 minute delay in the bus schedule. Portray the effects (i.e., worry, fear, anger, disappointment) this would have on the student.

4. Overcrowded conditions on the bus or subway can effect people with hypertension. Survey the class for experiences and reactions they or their family members have had in this situation. For example, the driver of an overcrowded bus does not stop to pick up more passengers. The results could be as follows; the persons who could not get onto the bus could feel angry or worried; the people who are on the bus could feel trapped or suffocated. In both situations, the blood pressure could go up and also a headache could develop, which would be harmful for people with hypertension.

ASSESSMENT TASKS:

1. Construct a paragraph to describe two ways in which the health of the people in a community is effected by traffic congestion.
2. Explain two ways in which a person with hypertension could be adversely affected by daily riding an overcrowded bus or subway train.
3. Construct a paragraph to describe how missing the bus, due to an irregular time schedule, could cause stress in a person at the beginning of a work day.

SCIENCE AND SOCIAL 'SSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 6 The students will be able to describe ı ⁄e methods that can be used to solve transportation problems.

SKILL: Communicating, Analyzing data

MATERIALS:

-References on Urban Transportation

-Comprehensive Plan for the National Capital - 1982 Comprehensive Plan Publications

ACTIVITIES:

1. a) Explain to the class that, since it has been found that transportation related problems do have detrimental effects on the people of a community, urban planners are designing methods that can be used to solve or alleviate these problems.

   b) Using provided references, have the students investigate alternate methods such as the expansion of mass transit, increased scheduling, pooling, construction of express transit lanes, the reorganization of parking plans, and differential fare plans.

2. Give the students hypothetical situations involving transportation problems and let them design solutions using the methods of the urban planners. For example:

   You leave work at 5:30 p.m. It is now 5:45 p.m. and you are stuck, in your car, in a traffic jam on New York Avenue. You are trying to get home by 6:15 p.m.

   Suggest alternate methods that you could have used to get home in 45 minutes.

3. Construct a diagram of a transportation system (i.e., travel paths, vehicles, terminal facilities) that contains two or more of the alternate methods used to solve transportation problems.

ASSESSMENT TASKS:

1. Explain, by writing a paragraph, how "car or van pooling" can reduce traffic congestion.
2. Give two ways restricted parking plans can help reduce air pollution by automobiles.
3. Describe, in a paragraph, how increased scheduling can reduce the overcrowded conditions on Metrorail, during the rush hours.

SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 7 Given the necessary references, the student will describe the history, effects and strategies for solving a current urban planning issue in D.C.

SKILL Communicating, Collecting data, Analyzing Data

MATERIALS:

-Various types of periodicals
-Comprehension Plan for the Nation's Capital
-Booklets, Pamphlets on various urban planning issues

ACTIVITIES:

1. a) Using provided references such as newspapers, magazines and other periodicals, have the students select specific urban planning issues currently of concern in D.C. For example, the areas of land use, transportation, population patterns, housing, public facilities, and environmental protection are of continuing interest.

   Note: Specific urban planning issues could include the following: Southwest waterfront development, Metrorail expansion, fire and ambulance service over the D.C./Md. line, Chesapeake Bay pollution, and beltway traffic problems.

b) Have the students construct a Poll sheet, listing the urban planning issues. This sheet can be used to survey a portion of the school's population to have them rank the issues in the order of their importance (from the students' point of view).

c) Have the class tally the results of the ranking poll, and make a list of the urban planning issues in the order indicated by the poll. Conduct a class discussion concerning the results of the poll.

2. Divide the class into small groups and let each group select one of the listed urban planning issues. The group will be responsible for constructing a project, on this urban planning issue, in which they investigate: a) the problem; b) the historical background; c) the causes and effects (or current problems involved); and d) strategies for possibly solving this issue. Each group can present its project in the form of an oral or written report with charts, graphs, and pictures.

   Note: In collecting data, the students will need various types of reference materials which the teacher can help them to locate. The students can also interview persons directly involved in this issue and/or invite a guest speaker to address the class.

ASSESSMENT TASKS:

1. Select one urban planning issue and describe its historical development in D.C.
2. Explain the causes and current effects of one urban planning issue in D.C.
3. Describe the strategies that could be used to solve one of the urban planning issues in D.C.

SCIENCE AND SOCIAL ISSUES

ISSUE: URBAN PLANNING/COMMUNITY FOCUS

LEVEL: 10-12

OBJECTIVE:

UP/CF 8 Given the information and experiences incorporated in this unit, the students will be able to construct a model or detailed drawing of an ecologically balanced city.

SKILLS: Communicating, Collecting Data, Hypothesizing

MATERIALS:

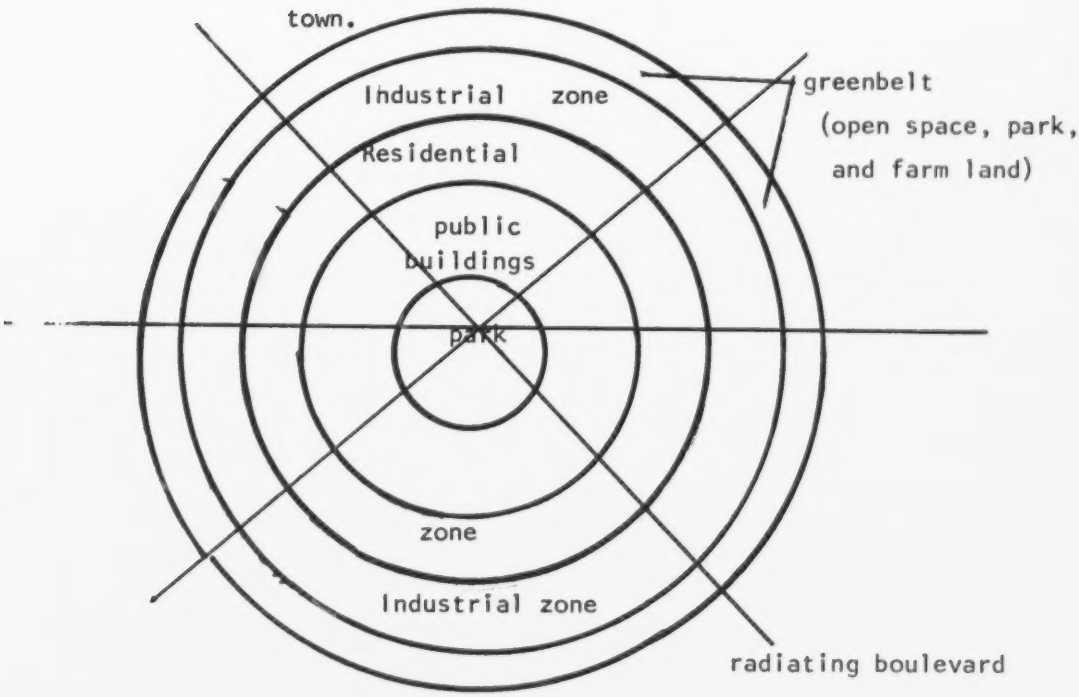
-Reference on Urban Planning, pages 122-125
A Guide to Urban Studies, William A. Andrews
-Assessment Tasks and Activities from the previous six objectives

ACTIVITIES:

1. When designing an urban city, city planners must consider: (a) how the factors of an urban environment influence one another; (b) the factors that influence land use patterns; (c) the transportation system and its effects on the population; and (d) the most current methods of urban transportation. Briefly review with the class all, of the these concepts that have been examined in the previous six objectives.

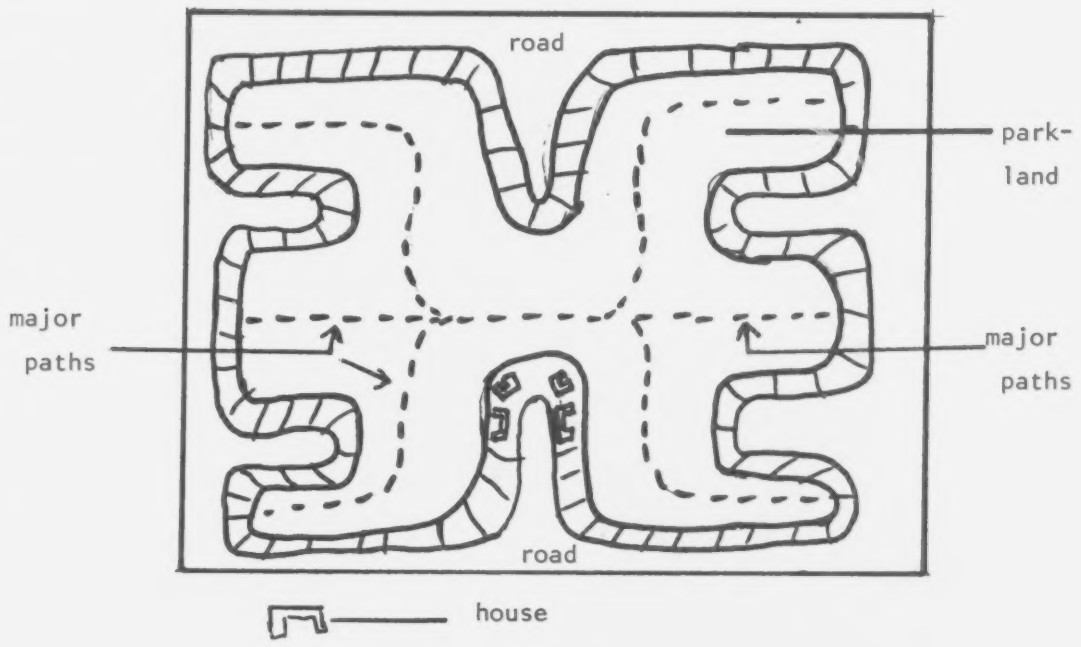
2. Given the necessary resources, have the class investigate various concepts of urban design and planning for cities such as: Garden Cities, the Neighborhood Unit, the Radburn Plan, the Broadacre City, the Vertical City and Arcology. Have the students make a chart in which each concept is described.

   a. Garden Cities - design proposed by Ebenezer Howard in 1898 to lessen congestion, squalor and discomfort in the city. Main features included: a circular town divided into six neighborhoods separated by radiating boulevards; a park in the center of town surrounded by public buildings and then a greenbelt, industry is located on the outskirts of the town.



b. The Neighborhood Unit - design developed by Clarence Perry in the 1920's. Main features: each community or neighborhood is a self-contained unit; apartment buildings and shops are located at the outside corners of the neighborhood; inner portion of the neighborhood is a residential area of single-family dwellings; 10% of the space is for parks and open space; inner streets are for local traffic; major traffic arteries bordered the neighborhood; the elementary school is the focus of the neighborhood.

c. Radburn Plan - design proposed by Clarence Stein in 1928 at Radburn, New Jersey. Main features: large superblocks with a community park in the middle; homes are located on cul-de-sacs with their fronts facing the parkland; automobile traffic is separated from pedestrian movement.



d. Broadacre City - design developed by Frank Lloyd Wright in 1934. Main features: urban-sprawl over a very large area; an automobile is needed to travel between residence, shopping and work; ranch style houses blend in with the environment.

e. Vertical City - design proposed by Le Corbusier in 1922. Main features: densely populated towerlike buildings separated by open green landscapes; the apartment towers had middle floors containing stores, banks, post offices, etc.; the buildings were raised above ground level on stilts for a feeling of spaciousness.

f. Arcology - design proposed by Paolo Soleri. Main features: densely populated multi-storied structure of twenty-five floors; self-contained structure with escalators and elevators.

ASSESSMENT TASKS - Product evaluation. Each student will be evaluated on the basis of his product (project).

1. Using all of the related activities and assessment tasks completed in the six previous objectives that you feel are necessary, construct a model or detailed drawing of an ecologically balanced city. In constructing this model you must consider the following factors: population density, land use, current transportation methods, the health of the population, and pollution - air, noise, and water.

2. Town Planning Exercise (7. 28) p. 207-211 A Guide to Urban Studies by William A. Andrews is an excellent Assessment for this unit. (A similar project is included below.)

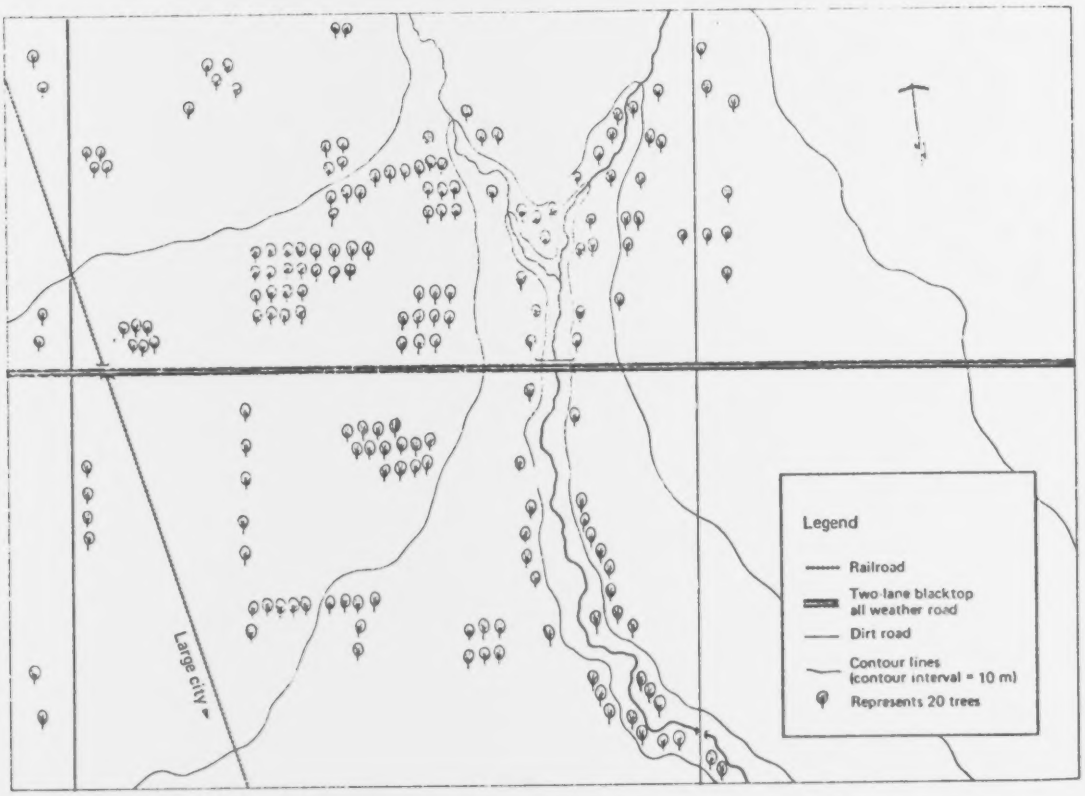
City Planning Project

Purpose - to construct a city that is ecologically balanced considering the factors of sound urban planning (see number 2 above).

Materials

City map
Colored pencils, ruler, eraser
Drawing paper

Procedure: a. Make several working copies of the map below on which to plan your city.



(Taken from Urban Studies by W. Andrews)

b. Planning Considerations

(1) The city should support about 30,000 people, and be relatively self-sufficient, i.e., providing the necessary goods, services and employment.

(2) Family structure: from the highest to the lowest percentage respectively, families of 3-4 people, childless families, families of 5-7 people, and widows or singles.

3) Accommodation: The majority of the residents are young families needing moderately priced housing. Include a balance of detached houses, townhouses, semi-detached houses, high- and low-rise apartment buildings. Consider how many people can be housed in each type of building so that the total population is adequately accommodated.

4) Services: Include essential services such as a police station, fire station, medical facility, municipal services, schools, subway stations, places of worship, placed in areas of maximum use.

5) Street Pattern: Determine the type of street pattern most appropriate for each area and function. Consider access to freeways and subway terminals.

6) City Center: This center should be one of the focal points of the city. It will take care of administrative, business and entertainment functions.

7) Commercial Land Use: Each neighborhood should have easy access to shopping areas.

8) Office Space: Include some office buildings for activities that require office space.

9) Industry: Determine what type of industry could be located in this city. Many of the people living in this city should be employed by this industry. Consider an area in which to locate this industry. It should be linked to the transportation system and have space for expansion.

10) Recreation: The city should have adequate parkland to accommodate the community. Parks should be used by adults and children. Consider a mixture of greenbelts in each neighborhood.

c. On the basis of your planning considerations draw the city design on a working copy of the city map. Label the functions and features that are shown. For example, mark the sewage treatment plant.

d. When you are satisfied that your working copy of the city map meets all requirements, make a final copy that will be turned in to the teacher. Color code the map to distinguish areas of different functions for example, residential: houses - red; apartments - pink; office - dark blue, etc.

Note: Do not show individual houses. Color in blocks of land that contain houses. Do show individual apartment buildings.

Discussion/Summary:

Write a report to describe, in detail, the urban planning concepts that you have used and what you have achieved through the design of your city.

This assessment task will be evaluated upon the completion of the students "City Planning Project." The teacher could make up a check list containing the planning factors and considerations and then base the grade earned on how many of these had been satisfactorily completed. The written report that accompanies the model/drawing would also be graded on how completely the urban planning concepts are described.

REFERENCES

URBAN PLANNING

A list of pamphlets needed for each teacher to accompany the unit on Urban Planning.

For use with the objective on Infant Mortality, order classroom set of: KEEP YOUR BABY ALIVE AND HEALTHY, D.C. Government, May 1979. Obtain these from the Improved Pregnancy outcome project 2146 Georgia Ave., N.W. 20001. This office has many other related single-copy pamphlets from government agencies and private companies with information on pregnancy, the new parents, diet, and the new baby.

For use with the objective on STRESS, the flyer from the D.C. Hotline: 462-6690.

General References useful as background information.

Andrews, William A. (Ed.). A guide to urban studies. Scarborough, Ontario: Prentice-Hall of Canada, Ltd., 1976.

Berger, Alan S. The city-urban communities and their problems. Dubuque, Iowa: Wm. C. Brown Company Publishers, 1979.

Bishop, Margaret S., Lewis, P. G., & Sutherland, B. Focus on earth science. Columbus, Ohio: Chas. E. Merrill Publishing Co., 1976.

Comprehensive Plan Publications. Comprehensive plan for the national capital. Washington, D.C.: Author, 1982.

Educational Challenges, Inc. Adventure in environment. Morristown, New Jersey: Silver Burdett, 1972.

Engineering Concepts Curriculum Project. The man-made world. New York: McGraw-Hill, 1971.

O'Connor, John R., Gall, M., & Goldberg, R.M. Exploring the urban world. New York: Globe Book Co., 1979.

Project CREATION. Activities handbook - land use. LaSalle, Illinois: Author, 1980.

Project CREATION. Urbanization and zoning - a land use unit. LaSalle, Illinois: Author, 1982.

REFERENCES

URBAN PLANNING

For use with the objective to Identify Urban Problems, order a set of: CITIES: AN ENVIRONMENTAL WILDERNESS

EPA, OPA 84/8 June 1978
Remarks by The Honorable Barbara Blum, Deputy Adm. before the Sierra Club at Berkley, CA., 5/6/78

In case you decide to do an objective on rodent control, order a set of: Rat Attack, UCOM Educational, Inc. 907 Culver Rd., Rochester, N.Y. 14609 1970

Obtained in the D.C. Area through the Department of Environmental Services (DES) War on Rats, 120 Ingraham St., N.E. telephone 576-7187

Order a classroom set of these if possible. Also request single copies of two other pamphlets from the local War on Rats headquarters:

--RATS. Rochester, N.Y. Media Learning Corp.

and

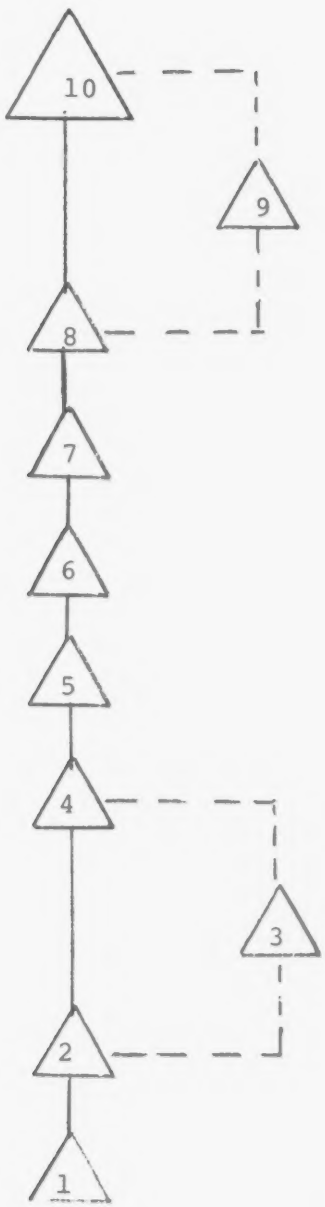
--CONTROL OF DOMESTIC RATS & MICE, U.S. Dept. of Health, Education, and Welfare (HEW), Public Health Service, Consumer Protection and Environmental Health Service Environmental Control Administration, Rockville, Md. 20852.

--The DES, Community Education Division phone number is 576-7187.

URBAN PLANNING

PERSONAL FOCUS

URBAN PLANNING/PERSONAL FOCUS Hierarchy



PHYSICAL SCIENCE: SOCIAL ISSUES

ISSUE: URBAN PLANNING- Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-1. Given various clippings from periodicals on urban life, the student will rank in order of importance problems associated with life in the inner city.

UP-2 Given information on human population growth and the mathematical formula used to calculate that increase, the student will construct tables and/or graphs to demonstrate the growth of the population in the USA and in the world for the next 100 years, using the present known rates of increase.

UP-3 Given a number of dice and the rules for "Modeling Exponential Growth", the student will demonstrate two of the several aspects of population changes with a chart and a graph.

UP-4 Given cultures of organisms to observe, the student will be able to describe possible reasons for the changes taking place in the population.

UP-5 Given information about personal space and housing space, the student will describe five improvements which could be made in a specified family living area which would optimize the use of the available space.

UP-6 Given information on stress and its causes in teenagers, the student will be able to describe ways to minimize those situations in his life that are stressful to him.

UP-7 Given information and statistics on the urban infant mortality rate, the student will be able to describe possible causes for the deaths.

UP-8 Given instruction in the use of blood pressure measuring apparatus, students will make a blood pressure survey in the class and make a histogram of the data for the purpose of making comparisons.

UP-9 Given instruction on venereal diseases and their prevalence among teenagers, students will be able to describe procedures for the detection and treatment of these diseases.

UP-10 Given the information and experiences incorporated in this unit, the student will be able to describe the advantages and disadvantages of living in his/her community and the personal choices that have to be made.

SOCIAL ISSUES

ISSUE: URBAN PLANNING- Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-1 Given various clippings from periodicals on urban life, the student will rank in order of importance problems associated with life in the inner city.

SKILL: Communication

MATERIALS:

--clippings on urban life from periodicals

ACTIVITIES:

1. Distribute news clippings on problems in urban living to each student. Allow 10-15 minutes for students to identify:

   a. the major problem of concern.
   b. contributing factors to the problem.
   c. special interest groups in conflict over the problem.

   Students will list these in their notebooks.

2. Students will write the title of the problems on the chalkboard when activity one is completed. The teacher will introduce the concept of ranking and lead students' vote in ranking the list of problems they wrote on the chalkboard.

   One student or the teacher will re-arrange the list of problems from most important to least important and copy the list on a ditto spirit master for duplication and distribution at the next class session.

5. The teacher will help students associate problems of urban life with key words like population, unemployment, zoning laws, etc. Call on different students to summarize in one word a problem from the list which was given to them. (See list of key words in assessment task # 2).

6. Students will organize into teams and choose one of the problems and describe possible solutions for it.

ASSESSMENT TASKS:

1. The class has ranked the problems in urban living from most important to least important. The ranking was done by majority vote. Take the list and mark the five most important ones in your life from the lis regardless of their position in the class ranking. Give the one with the highest priority (1) and the one with the lowest priority (2).

2. Write one sentence or more about each of your choices stating why the choice was ranked that way.

3. Join with three other students to form a group of four persons. Each person takes a turn to tell the other three members why your ranking of the problems in urban living are important to you. Jot down notes about each of the five problems from feedback that other group members give you. At the end of this sharing and feedback session, each person will turn in his list with the comments he has received from other members in the group, to the teacher.

SOCIAL ISSUES

ISSUE: URBAN PLANNING - Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-2 Given information on human population growth and the mathematical formula used to calculate that increase, the student will construct tables and/or graphs of the population in the USA and in the world for the next 100 years, using the present known rates of increase.

SKILL: Using Time/Space Relationships

MATERIALS: Recent statistics from the world and USA population sources: Telephone or write the Population Reference Bureau; 785-4664, 1337 Conn. Ave., N.W.

U.S. Bureau of Census, 763-5002

DCPS film no. 1435, Population Ecology, 19 min. S

Graph paper

ACTIVITIES:

1. Show the film Population Ecology (no.1435). Summarize the important points of the film from the standpoint of overcrowding and available food supply and resources.

2. Have students define the following terms:

birth rate	doubling time
death rate	random
unrestricted growth	contraception
zero population growth	conception

Pupils should memorize these terms as applied to population situations.

3. Introduce the term "exponential growth" of a population by using the example of a culture of bacteria which undergo fission every 20 minutes under optimum conditions.

Help students plot this by constructing the graph on the chalkboard. Time is on the x axis.

Time in minutes	0	20	40	60	80	100	120	140	160
Number of bacteria	1	2	4	8	16	32	64	128	256

4. Relate activity #3 to a discussion of human population numbers in the schools and in even larger communities pertinent to the students' questions and feedback.

   in D.C. schools: see activity five

   in D.C. as a whole: in 7/1/70--757,000

   in 7/1/78; 674,000 (an 11% decrease)

   in the USA as of 4/1/79; 219,930,000 million increasing at a rate of 0.8%

   in the world as of 7/1/79: 4.321 billion and increasing at a rate of 1.7%

5. Have students make a graph showing 3 different lines of the changes in the D.C. school population on three levels of interest: elementary, junior high, and senior high. Point out the shift in peak years for each level. Make one graph for the overhead projector or chalkboard. Use the information to introduce the idea of the need for the graph. Use the following table of data for the graph. Teach students how to round numbers to the nearest tenth of a thousand. (Refer to the Physics unit in the Laboratory Skills Curriculum Guide for further assistance).

*NOTE: The population formula is as follows:

$$\frac{72}{\text{percent of increase (rate of increase)}} = \text{Time needed to double in number}$$

UP-2

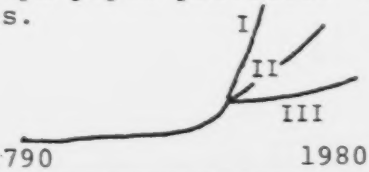
ENROLLMENT IN PUBLIC SCHOOLS OF THE DISTRICT OF COLUMBIA

Year	Level of School		
	Elementary	Junior High	High School/Vocational H.S.
1960	80,805	24,419	14,960
1961	83,733	26,866	15,581
1962	86,147	28,640	17,027
1963	87,792	29,579	19,309
1964	89,719	29,922	20,983
1965	92,665	29,180	21,552
1966	94,250	29,769	21,932
1967	95,353	31,256	22,110
1968	94,378	32,467	22,176
1969	93,270	33,250	22,534
1970	90,433	33,062	22,209
1971	87,629	32,108	23,096
1972	83,869	31,861	24,188
1973	77,927	33,399	24,910
1974	74,432	33,545	23,714
1975	71,346	32,781	24,417
1976	68,501	30,293	23,579
1977	64,083	28,784	23,250
1978	59,835	26,516	21,677

ASSESSMENT TASKS:

1. The world population is growing at an annual rate of 1.7%. Start with the figure 4.3 billion persons in 1979 and use the formula to calculate the annual population growth from 1979 to 2080 A.D. Construct a graph which shows this annual increase. Be sure to title the graph and label the axes.

2. The rate of growth of the population of the U.S. has begun to decline from 2% per year. Use the following table of data to graph several different possibilities for the population changes in the next 50 years. Your finished graph will branch into three parts after 1960. Let Series I. Series II, and Series III lines spread apart like forked branches from a tree trunk.
   Use the graph paper provided. Be careful in choosing your scales.



Year	Population in Millions		
	Series I	Series II	Series III
1790	3.9		
1800	5.3		
1810	7.2		
1820	9.6		
1840	17.1		
1860	39.9		
1880	50.3		
1900	92.4		
1920	106.5		
1940	132.6		
1960			
1980			
2000			
2020			
2040			

Year	Population in Millions		
	Series I	Series II	Series III
1960	180.7		
1980	225.7	222.8	220.4
2000	287.0	262.5	245.1
2020	362.3	294.0	259.1
2040	448.9	312.0	237.9

Note: Series I presumes a fertility rate of 2.7 children born per woman; Series II: 2.1 children per woman; Series III: 1.7 children per woman.

Use (-) to indicate no value given.

3. The latest projections from the U.S. Census Bureau show that the population of the Western U.S. will rise by 45% between 1980 and 2000. The Midwest will stay essentially the same and the Northeast will experience a noticable decline.
Use the table of data provided to graph the population changes in the Western U.S. and the Northeast U.S. **

PROJECTIONS BY STATE

	State	Population in 2000	Change From 1980	1980 Rank	2000 Rank
Western U.S.	Washington	5,832,500	Up 41.2%	20	13
	Oregon	4,025,300	Up 30.4%	26	27
	Idaho	1,512,200	Up 60.2%	41	39
	Nevada	1,918,800	Up 140.1%	43	36
	Utah	2,777,400	Up 90.1%	36	33
	Wyoming	1,002,200	Up 112.9%	49	43
	Colorado	4,656,600	Up 61.2%	28	21
	Arizona	5,582,500	Up 105.4%	29	15
	Texas	20,739,400	Up 45.8%	3	2
	California	30,613,100	Up 29.3%	1	1
Northeast U.S.	Michigan	9,207,600	Down 0.5%	8	8
	Illinois	11,187,500	Down 2.0%	5	6
	Ohio	10,356,800	Down 4.1%	6	7
	Pennsylvania	11,207,600	Down 5.6%	4	5
	New York	14,990,200	Down 14.6%	2	4
	Massachusettes	5,490,400	Down 4.3%	11	16
	Connecticut	3,062,400	Down 1.5%	25	29

** The data above is taken from U.S. News & World Report, September, 1983.

PHYSICAL SCIENCE: SOCIAL ISSUES

ISSUE: URBAN PLANNING - Personal Focus

LEVEL: 10 - 12

OBJECTIVES: UP-3

Given a number of dice and the rules for "Modeling Exponential Growth," the student will demonstrate two of several aspects of population changes with a chart and a graph.

MATERIALS/ADVANCE PREPARATION:

-- four sets of 300 dice or cubes each

-- large can (2 lb. coffee can) or shoe box for shaking dice

-- graph paper

ACTIVITIES:

1. Use dice or marked cubes and random throws to stimulate population changes. Rules for the population game: "MODELING EXPONENTIAL GROWTH" by John Christensen are given in The Journal of Energy Education, Vol. 1, No. 1, Winter, 1978, pp. 41-46. Notes to the teacher are also included, as are directions for making the cubes. Single copies of this journal may be obtained by writing:

   Editor
   Journal of Energy Education
   c/o Public Service Company
   P.O. Box 840, Room 974
   Denver, Colorado 90201

   There should be a discussion which addresses the variations in the graphs as they relate to the various aspects of population change.

2. Have the student use the same game and rules as in number one, but instruct him to choose a different option for playing the game than he used the first time. Graph the results of both the first option and the second option.

ASSESSMENT TASKS:

1. Compare the graph you made from the simulation game: Modeling Exponential Growth with that of another person who used the game. List the similarities and differences. Why do you think these similarities and differences occurred? Hand in your comparisons and answers to the question, to the teacher.

2. Hand in your chart and graph of the population change as determined by the dice in the simulation game: Modeling Exponential Growth. Make sure that you have labeled your axes and entitled your graph.

3. Multiple choice: reading a graph, and calculation of growth. Circle the letter of the answer you choose.

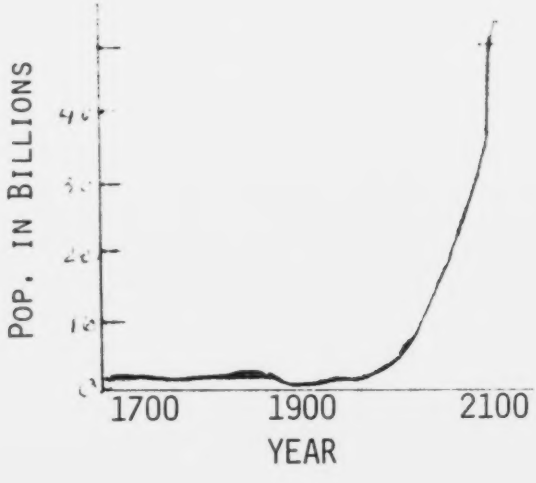
   a. The present average rate of population increase for the entire world is approximately (a) .8% per year (b) 2% per year (c) 5% per year.

   b. Assume a birthrate of 5% per year in a town having 100,000 population at the beginning of the year. How many new babies would have been born during the year? (a) 50 (b) 500 (c) 5000 (d) 50,000

   c. Of the following, which explains the "explosive" population increase in the world? (a) the birthrate has increased (b) people live for several generations (c) the birthrate increased (d) there have not been enough wars and disease

   d. Of the following, which is the most likely to occur with regards to the worlds population within the next few hundred years? (a) the population will level off and possibly drop (b) the population will continue to increase at the present rate indefinitely (c) the population will decrease as more people start living on other planets (d) although we will be hungry and crowded, we will live happily together

GROWTH OF
WORLD POPULATION



Assuming the graph to be a plot of the world's population, what would you estimate the population to be in the year 1990?

Ans._____

Extra credit

At the beginning of a year a certain town had a population of 36,000. Assuming a birthrate of 6% per year, a death rate of 4% per year and equal amounts of immigrants and emigrants, what would the population be at the end of the 5th year?

ISSUE: URBAN PLANNING-Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-4 Given cultures of organisms to observe, the student will be able to describe possible reasons for the changes taking place in the population.

SKILLS: Experimenting, Observing

MATERIALS:

--a culture of one or more pf the following organisms; yeast cells/paramecium/daphnia/fruit flies
- student direction sheets for their culture in the laboratory.
- microscopes, slides
- test tubes, culture dishes/jars
- nutrient media
- ether, camel's hair brush
- autoclave or pressure cooker
- Biology Teachers' Handbook, Schwab, pp 560-570.

ACTIVITIES:

1. Conduct a class discussion with diagrams to show the reproduction methods of the organisms to be studied. The discussion should include asexual (i.e. budding and fission) and sexual reproduction.

2. Conduct a population study of the culture for one week to a month.

a. 1. Pass out lab sheets for culturing organisms.
2. Discuss the organism to be cultured--habits, requirements.
3. Demonstrate how to handle the nutrient culture medium.
4. Allow students to make their first day population count. Record how many species are observed.
5. If yeast cells are used, demonstrate the sampling and dilution techniques.
6. Allow time daily during this week and the next few weeks for the students to make population counts and record their results.
7. Have each student make a graph of his data.

b. Conduct a classroom discussion in which students compare results and offer possible reasons (hypotheses) for any changes observed in the studies.

NOTE: References for conducting a population study:

Biological Science Curriculum Study:

-Biological Sciences-a Molecular Approach. Toronto: D.C. Heath & Co. p 26.

-Biological Sciences- Patterns and Processes. Revised Ed. New York: Holy, Rhinehart & Winston, 1970, pp 33-37.

BSCS, Teachers Edition, 1970, pp 31-39.

Schwab, Joseph, Biology Teachers' Handbook. 1963. New York: John Wiley & Sons, Inc. pp560-574.

c. Pool the class data for specific organisms. Have the students draw a graph to depict the combined data.

ASSESSMENT TASKS:

1. Describe at least two changes observed in your population and explain why you think these changes occurred.

2. Compare your individual graph of experimental data to that of the class. List the similarities and differences that you observe.

3. Write a paragraph to explain the similarities and differences between your work and that of the class.

NOTE: This assessment strategy is an example of "product" evaluation. Each student has, in effect, conducted an investigation and can offer his data to peers for academic discussion.

SOCIAL ISSUES

ISSUE: URBAN PLANNING-Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-5 Given information about personal space and housing space, the student will describe five improvements which could be made in a specified family living area which would optimize the use of the available space.

SKILLS: Measuring, Using Space/Time Relationships

MATERIALS:

- floor plan of a house/apartment giving room dimensions, location of doors and windows, prepared for the overhead projector or for the bulletin board.
- student spirit master handouts of a floor plan
- meter stick, yard stick, or carpenter's tape or folding rule.
- magazine pictures from Good Housekeeping, Better Homes and Gardens, etc. of attractively furnished rooms.
- centimeter rulers

reference: Wentworth, D.F. et. al. Mapping small places. 1976. Toronto: Holt, Rhinehart & Winston

RATIONALE/BACKGROUND INFORMATION:

The students have gained some concept of population changes and exponential growth from activities 2,3,and 4. Within their crowded world, it is important that they realize that they can maintain and renew their mental outlook/health by establishing personal space. These activities are designed to help them select a space and make it attractive and functional for themselves.

ACTIVITIES:

1. Discuss with students the following questions;

   a. How many persons live in your neighborhood?
   b. How many of these are older than you?
      How many are younger?
   c. Where do you go to relax at home?
   d. Where do you go to study, do homework?
   e. Do you dine with the rest of the family?
      Do you all sit down at the table together?
   f. Do you have a comfortable sleeping area?

2. Now that pupils are thinking about their living conditions at home, discuss with them the rationale for this objective.

3. Show a sample floor plan of a house/apartment using the bulletin board display or overhead projector, and hand out sheets to students.

   a. Show students how to measure the classroom to the nearest 0.5 foot or 0.1 meter, and how to make a scale of those dimensions, selecting an appropriate scale on the centimeter ruler; --perhaps 1 cm = 1m or 1cm = 2feet, depending on the measuring stick used.

   b. Overnight homework assignment--
      Direct students to make a floor plan of their houses/apartments to scale showing the rooms and dimension lines.

4. Discuss the student's floor plan by having each person examine his own drawing to learn which part of home should be designated as:

   -the family recreation area
   -his quiet (study) area
   -the dining area
   -his sleeping area

   Assign students to use these four areas in a consistent manner for one week, keeping a record of the minutes/ hours he spends in each.

5. Pass out pictures, magazines, home furnishing and decorating ideas. Have students select and describe on of the following areas in the home (Recreation, sleeping, dining, quiet). Using color schemes, furniture arrangement, fabric and other home decorating ideas form magazines, construct

a plan which would improve this area by optimizing use of available space in the room.

Present this plan to the family members and ask members for comments, criticisms and suggestions. Taking all of these into consideration, improve the plan so that it is acceptable to family members.

ASSESSMENT TASKS:

1. Describe the sleeping area in your house/apartment. List five advantages and five disadvantages of this space allocation. Make suggestions for solving the disadvantages.

2. Describe the dining area in one of your classmate's house/apartment. Examine the area carefully and choose five things that you would change. Describe the improvements that you would make to best utilize the available space.

3. Invite a friend over to look at the recreation space in your home. Have him/her identify the things that could be changed to best utilize the space more efficiently. Write these down. Present his/her ideas to your family and ask them to react to the proposed changes. Check those changes that they would accept, keeping a record of their reasons for rejecting others. Write up the activity and turn it in to the teacher.

PHYSICAL SCIENCE: SOCIAL ISSUES

ISSUE: URBAN PLANNING - Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-6 Given information on stress and its causes in teenagers, the student will be able to describe ways to minimize stressful situations in every day life.

SKILL: Communicating

Materials

-- list of Stress Factors in Teenagers' lives
-- list of Stress Factors in Adults' lives
-- articles on ways to reduce stress, such as

"How to Survive Today's Stressful Jobs", Pam Procter, The Washington Post, Parade Magazine. June 17, 1977 pp. 4 - 5

-- Flyer from D.C. Hotline: 462-6690

RATIONALE/BACKGROUND INFORMATION:

Teenagers are under many stresses that adults have outgrown and that elementary aged children haven't encountered. These stresses can affect their work performance and interactions with others. An understanding of the root of each stress and an action step to eliminate or minimize it will help the student to a more satisfying life and fuller participation in the community.

STRESSES IN ADULT LIVES

	RANK
Death of Spouse	5
Divorce	4
Jail Term	3
Fired from work	2
Change in schools	1
Change in eating habits	1

NOTE: For a more complete list please see the following references:

1. Holmes, T.H., Rahe, R.H. "The social readjustment rating scale." Journal of psychosomatic research. 1967, 11, pp. 213 - 218.
2. Simonton, O. et al, Getting well again. Los Angeles; J. P. Tarcher, Inc. 1978

Activities:

1. Define stress. Have students to compile a list of situations which could cause stress in the life of a teenager. Support their list with the one in this triad.
2. Give students a description of a stressful situation. Conduct a discussion in which students determine the effects of this situation on the teenager and have them make suggestions as to ways to minimize or eliminate this stress.
3. Instruct the students to write down anonymously the one stressful situation in their lives that is bothering them the most at this time. Encourage them to state the situation as clearly as possible. Tell them to list any causes of the situation that they can detect. The students should not write names on papers (tear it off if its already at the top of the page.) Read an anonymous student's situation and conduct an orderly discussion by the students of what action steps could be taken to minimize or reduce that stress. In order that class interest may be maintained it might be wish to only work on 3 - 5

situations per period for several successive days until all situations have been heard and suggestions noted.

4. Have students investigate the purpose and services offered by the "D.C. Hot line."

5. Distribute the list of Stress Factors in Teenagers' lives. Ask if any of them need a further explanation? If so try to give an example for the student. Instruct students to try to rank them for the most stressful to least stressful with a point value of 5 (most) down to 1 (least). Discuss the rank values with the students.

6. Instruct the students to check each item on the list that is causing him discomfort at this present time. The student should add up his point score and consider the following analysis:

    a. If your score is greater than 15 you are in a highly stressed frame of mind or situation.

    b. If your score is less tha 10 you have the same sorts of concerns and stresses that most teenagers have.

    c. Even some persons in a highly stressed situation can cope with daily tasks and function well in society, while some other persons under those conditions may become ill.

7. Instruct each student to put only the number (his stress total score) on a small square of paper provided him (no name). Pass it in. List this series of numbers on the board from 15+ down to the lowest number. Discuss the meaning of this distribution of scores for the class with the students. Show them how to mark off the 20th percentiles based on the number of students handing in the total scores. Give them time to do the assessment tasks in class.

ASSESSMENT TASKS:

1. Divide a sheet of paper in half from left to right. Write the most stressful factor in your life now across the top of the page. Under it in the left column, write the heading: CAUSE. In the right column, write the heading:ACTION STEP. In the left column write one or two phrases that seem to be the cause of that stress for you. Opposite each cause, in the right column, write the action that you would take to eliminate or minimize that stress by removing or cancelling out the cause (s) or changing your way of living, etc. Hand in this stress, causes, and action steps to the teacher.

2. Identify at least two stress factors in your classroom. Suggest some causes for these and ways that they may be minimized or alleviated either by classmates or by the teacher.

3. Choose a teenage celebrity that you enjoy and admire.
   a. Identify stressful situations in his/her life.
   b. Suggest ways to minimize or alleviate this stress.

SOCIAL ISSUES

ISSUE: URBAN PLANNING- Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-7 Given information and statistics on the urban infant mortality rate, the student will be able to describe possible causes for the deaths.

SKILL: COMMUNICATING

MATERIALS:

-overhead projector, transparency, or student hand-out sheets of infant mortality rates in 1965.

-hand-outs from DHR Improved Pregnancy Outcome Project.

-guest speaker: school nurse or obstetrician.

ACTIVITIES:

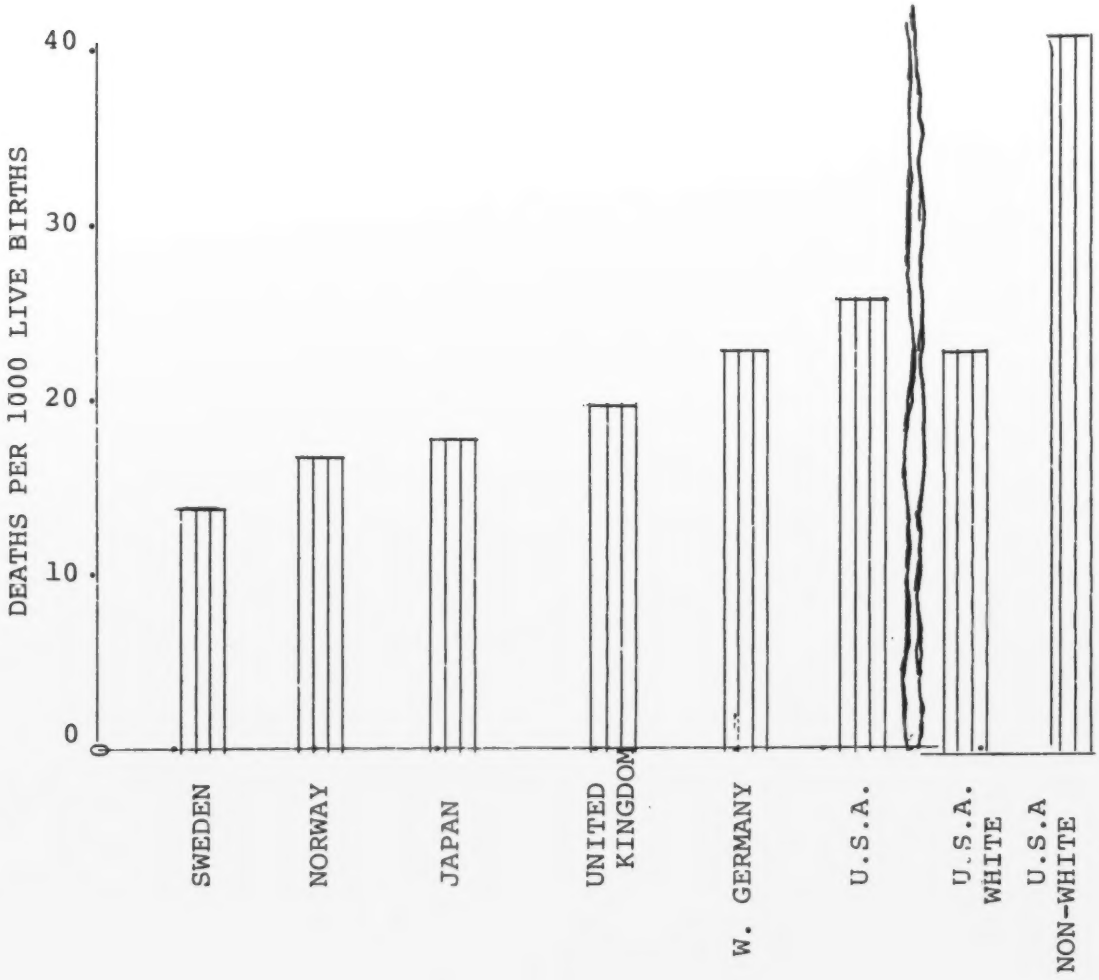
!. Show the graph of Infant Mortality rates in 1965. Ask students questions about it: Which country has the lowest rate? the highest rate? How many times more deaths are there of babies in the U.S. than in Sweden? How many times more non-white deaths in the U.S. than white deaths?

2. Ask students what might be the source of the reasons for this? Write their answers on the chalkboard (use their own words).

*Information for the teacher on probable causes of the high rate of non-white infant deaths:

a. Most of these occur in urban areas.
b. As high as 40% of these women had not seen a doctor during pregnancy.
c. Less than 3% of the physicians are black, while 11% of the total population is black.
d. Many of these women do not go to the clinic for any reason, much less pregnancy.
e. Many of these women are teenagers.

INFANT MORTALITY RATE IN 1965



3. Distribute the flyers on the Improved Pregnancy Outcome Project of the Department of Human Resources (DHR) and allow the students to discover the clinic closest to their homes and to the school. Ask the students questions to be answered from the pamphlet.

4. Bring in a physician or nurse from a "well baby clinic", or some other consultant to discuss with the class the death rate in D.C. alone. Have the students prepare questions in advance to asked of the visitor.

5. As a class project, have students construct a large bulletin board that lists and explains the causes for high urban infant mortality rates.

ASSESSMENT TASKS:

1. List five causes for high infant mortality rates.

2. Please match the condition on the left, with a possible cause on the right.

Condition	Cause

(The teacher can supply items for both columns from the content covered in class)

3. State at least two reasons that may explain why there are less deaths per 1000 live births in Sweden, than in the U.S.A.? than in U.S.A. non-whites?

SOCIAL ISSUES

ISSUE: URBAN PLANNING, Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-8 Given instruction in the use of blood pressure measuring apparatus, students will make a blood pressure survey in the class and make a histogram of the data for the purpose of making comparisons.

SKILL: Communicating, Measuring , Collecting and Interpreting data

MATERIALS:

-Film/projector/screen: "The Hard Way" (see NOTES for its source)

-Sphygmomanometer and stethoscope (as many sets of these as possible)

-Large bulletin board graph paper, or peg board and golf tees for the class' histogram.

ACTIVITIES:

1. Initiate a discussion with the students about persons they know who have had a heart attack, stroke or high blood pressure. Define hypertension as-- a systolic blood pressure above 160mm of Mercury.

2. Introduce the film "The Hard Way" and show it. Summarize it with the class. (See NOTES)

3. Define sytolic and diastolic pressures as follows:

   Systolic- the pressure immediately following contraction of the ventricles.

   Diastolic- the pressure at the relaxation of the ventricles.

4. Demonstrate the use of the sphygmomanometer. You may wish to have the school nurse do this. Have students take turns finding each other's blood pressure and recording the results. Compare individual results with the graph of Average Blood Pressure.

5. Organize a school-wide survey of blood pressure or at least the cooperation of students from another class.

6. Make a class histogram of results for all students in each age bracket: 13-14, 15-16, and 17-19. Discuss the distribution of pressures.

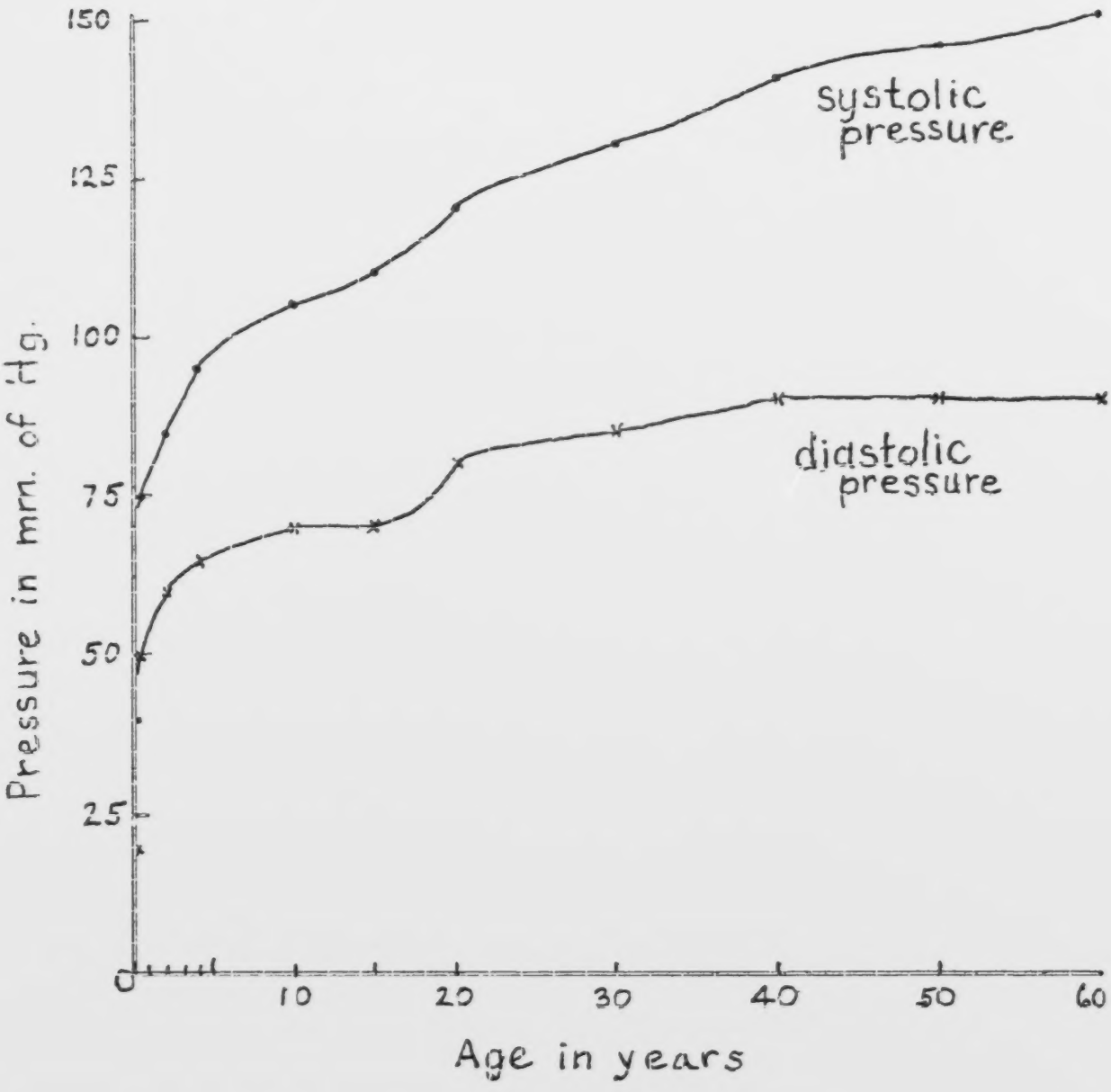
NOTES: Sources of information on Hypertension and other forms of heart disease.

1. National High Blood Pressure Education Program: 652-7700. 7910 Woodmont Avenue, Bethesda, MD 20014.

   This is the source of the film on hypertension "The Hard Way", narrated by Bill Cosby. Telephone your request in advance and they will notify the distributor to send you the film on a 30-day free loan basis.

2. American Heart Association, Nations Capitol Affiliate- 337-6400, 2233 Wisconsin Avenue, N.W. They have a large film library. They also conduct the Heart Lecture Series Contest for high school students.

Average Blood Pressure at Different Ages (Millimeters of Mercury



Some variations from these readings is considered within the normal range.

125

ASSESSMENT TASKS:

1. Using the data collected from the class survey, prepare the following histograms:

   a. Make a histogram of blood pressure measurements according to the sex of the students.

   b. Identify all pressure measurements of students who are currently participating in a varsity sport. Draw a histogram to comapre these pressures with those of non-participating classmates.

2. Using the data collected from the survey, determine the average pressure readings for each age within the class. Compare these averages with the Average Blood Pressure graph. Write a short paragraph explaining your observations.

SOCIAL ISSUES

ISSUE: URBAN PLANNING, Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-9 Given instruction on venereal diseases and their prevalence among teenagers, the student will be able to describe procedures for the detection and treatment of these diseases.

SKILL: Communicating

MATERIALS:

-screen/projector/film on:
.No. 54, VD- See Your Doctor, 22 min. J.S.A. C.

.No. 2816, VD Questions, VD Answers. 15 min. I-S. C.

-slides from Wards Catalog,
.Venereal Disease one microslide no. 26W 9094
It contains pictures of:

Gonorrhea Bacterium (2. 888x)
Gonococci in Pus (500x)
Spirochete (34,000x)
Syphilis Bacterium (54x)
Skin Rash-Nerve cell damage (950x)
Congenital Syphilis:
Chancroid (900x)
Donovan Bodies (900x)
A slide- Crab Louse (50x)
Crab Louse Nit (50x)

.Slide of Trichomonas vaginalis (frequently detected in urine), 92W 4273

-fact sheet on the prevalence of these diseases in D.C. (obtainable from D.C. Department of Health)

-classroom visitation and presentation from the school nurse or other health official.

RATIONALE/BACKGROUND INFORMATION:

This objective can be optional if you do not feel comfortable with teaching it. You might wish to consult with the school nurse or a physician about teaching symptons and treatment.

An excellent source of content is the Personal/Family Living Curriculum Guide, obtainable from the Physical Education Department office.

ACTIVITIES:

1. Distribute the fact sheet on the prevalence of VD in the metropolitan area. Discuss these figures with the class. Generate opinions as to why the statistics are so large.

2. Show the film on VD. Follow this with a discussion of the causative organisms involved, the symptons, and the treatment for each disease identified. The nurse or health official might be a good discussion leader at this point.

3. Using a wall map of the city, identify locations of clinics specializing in the treatment of VD. Distribute this information to the students in a handout.

NOTES:

1. The following D.C. Government Health offices are sources of pamphlets and film on venereal diseases.

   VD Control Program, 613 G St. N.W.- 727-9857
   (This office offers assistance to the teacher in the preparation of the lesson plan and instructional techniques)

   Film Library, 801 N. Capitol St., N.E.- 727-3297

2. Prevalence of gonorrhea in the USA is approximately 2 million new cases per year.

   Of syphilis is approximately 80 thousand cases per year.

3. 60% of those infected are under 25 years of age. These figures do not include many cases that are never reported.

4. In a recent study by researchers at Johns Hopkins University, 67% of young women had sexual intercourse by age 19. Among young black women the figure was

83% (Washington Post, 7/4/9)

5.A very readable, short, concise look at VD can be found in Grover, John W.. VD, The ABC's. Englewood Cliffs, N.J., Prentice Hall, Inc., 1971.

6.The Telephone number for the VD Hotline is 832-7000.

ASSESSMENT TASKS:

1. Write a description of the symptoms, and treatment of gonorrhea.

2. Explain the long term effects of syphilis and gonorrhea on the human body if the diseases are not arrested.

**3. In the matching exercise below, choose the letter of the best response in column II and place it in the blank space provided in column I. Write the letter of your choice as a capital letter. (One response has no premise).

I	II
_____1. An itching sensation in the vagina; a burning sensation during urination.	A. the spirochete of syphilis
_____2. Large growths on the genitals.	B. E. coli of the colon
_____3. A pimple followed by an ulcerated lesion.	C. venereal warts
_____4. A discharge of pus from the penis; difficulty in urination.	D. trichomonas vaginalis
_____5. Scabby, hard, small growths on the genitals.	E. gonococcus of gonorrhea
	F. chancroid

** Other choices may be substituted or added, depending upon the content offered in the triad.

129

SOCIAL ISSUES

ISSUE: URBAN PLANNING, Personal Focus

LEVEL: 10-12

OBJECTIVE:

UP-10 Given the information and experiences incorporated in this unit, the student will be able to describe the advantages and disadvantages of living in his/her community and the personal choices that have to be made.

SKILL:

MATERIALS:

- pamphlets from community service organizations used in the previous objectives from both sub-issues.
- students' assessment tasks from the previous objectives from both sub-issues.
- spirit duplicated outline maps of the city showing the arterial highways and the four quadrants of the city (NW, NE, SW, SE)

ACTIVITIES:

1. Review the community's resources discovered through students' work in the previous objectives in both community focus and personal focus of urban planning.

   Discuss action plans proposed by students to remedy some of the obvious deficiencies of the community which they have uncovered.

2. Using the chalk board, list overall advantages and disadvantages of living in this community; have students generate these through a discussion of the material presented in the previous objectives.

3. Have the students examine carefully the lists of advantages and disadvantages that they have generated. Have them internalize living with these advantages and disadvantages, examining what effects these have had on their personal lives.

   Then have students independently identify and explain personal choices that have to be made as they encounter and deal with these advantages and disadvantages.

ASSESSMENT TASKS:

This is product assessment!

Please write a short essay on one of the following:

1. Why I like to live in Washington, D.C..

2. Why I would like to move away from Washington, D.C..

Be sure to include at least...

a. some mention of an advantage to living here

b. some mention of a disadvantage to living here

c. attention to a political aspect of residence in D.C.

d. attention to transportation in D.C.

e. the availability of services that contribute to a person's welfare

REFERENCES:

A list of pamphlets needed for each teacher to accompany the unit on Urban Planning.

For use with the objective on Infant Mortality, order classroom set of : KEEP YOUR BABY ALIVE AND HEALTHY,D.C. Government, May 1979. Obtain these from the Improved Pregnancy outcome project 2146 Georgia Ave., N.W. 20001. This office has many other related single-copy pamphlets from government agencies and private companies with information on pregnancy, the new parents, diet, and the new baby. For use with the objective on STRESS, the flyer from the D.C. Hotline: 462-6690.

General References useful as background information.

#1 Bishop, Margaret S. Lewis, P.G., Sutherland, B.
FOCUS ON EARTH SCIENCE 1976
Chas. E. Merrill Public Co. Columbus, OH 43216

#2 Engineering Concepts Curriculum Project.
THE MAN-MADE WORLD, 1971, McGraw-Hill Book Co. N.Y., N.Y.

#3 O'Connor, John R., Gall, M, Goldberg, RM,
EXPLORING THE URBAN WORLD, 1979
Globe Book Co., N.Y., N.Y. 10010

#4 ADVENTURE IN ENVIRONMENT, National Environmental Education Development, developed by Educational Challenges, Inc. 160[illegible] - 20th St., N.W., D.C. 20009
Silver Burdett General Learning Corp., Morristown, N.Y. 1972

REFERENCES:

For use with the objective to Identify Urban Problems, order a set of: CITIES: AN ENVIRONMENTAL WILDERNESS
EPA, OPA 84/8 June 1978
Remarks by The Honorable Barbara Blum, Deputy Adm. before the Sierra Club at Berkley, CA., 5/6/78

In case you decide to do an objective on rodent control, order a set of: Rat Attack, UCOM Educational, Inc.
907 Culver Rd., Rochester, N.Y. 14609
1970

Obtained in the D.C. Area through the Department of Environmental Services (DES) War on Rats, 120 Ingraham St., N.E.
telephone 576-7187

Order a classroom set of these if possible. Also request single copies of two other pamphlets from the local War on Rats headquarters:

_ _ RATS. Rochester, N.Y. Media Learning Corp.

and

_ _ CONTROL CF DOMESTIC RATS & MICE, U.S. Dept. of Health, Education, and Welfare (HEW), Public Health Service, Consumer Protection and Environmental Health Service Environmental Control Administration, Rockville, Md. 20852

_ _ The DES, Community Education Division phone number is 576-7187

FOOD AND NUTRITION

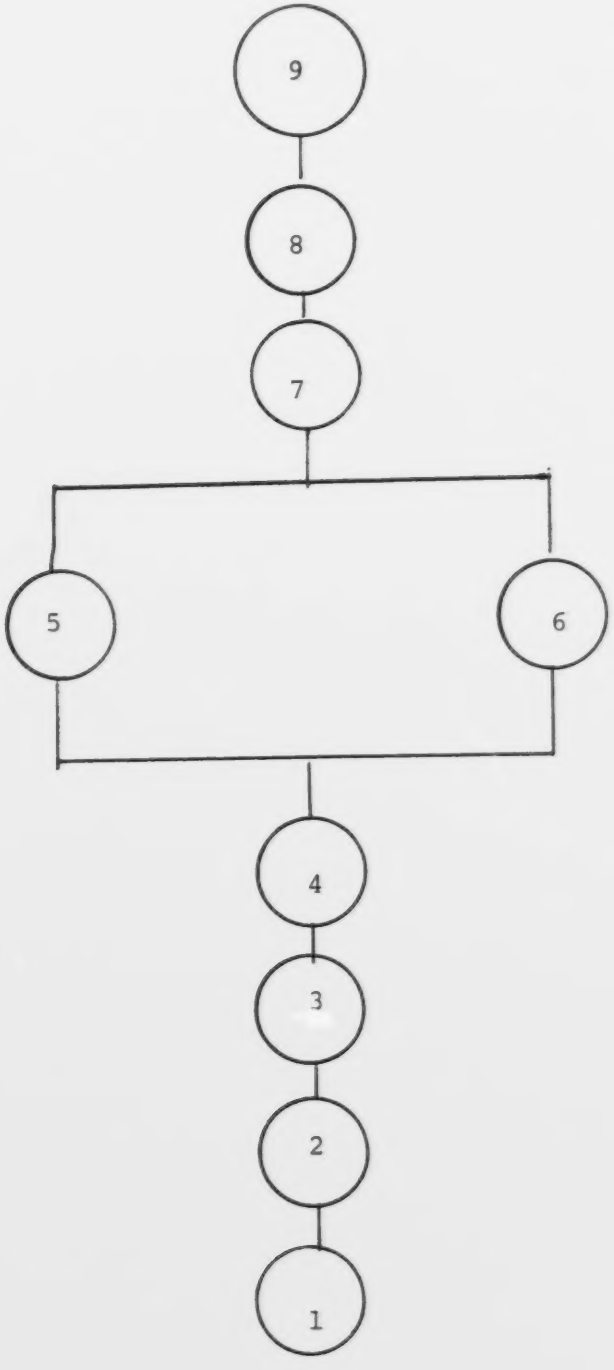
RATIONALE

ISSUE: FOOD AND NUTRITION

During our lives, we choose among alternatives that may have desirable or undesirable consequences for our health. Nutrition education should prepare students to make intelligent food choices and to establish healthful dietary habits.

However, the task does not end here for it is equally important that our students recognize the role that food plays in the physical and mental health of a society or nation, in addition to the role played in the individual's immediate life. To take this one step further, it is imperative that our students realize that only as well-informed and socially aware members of society, will they have the ability and the power to effect positive and beneficial change in regard to public policy affecting the nutrition of all people.

FOOD AND NUTRITION Hierarchy



136

ISSUE: FOOD AND NUTRITION

FN-1 The student will be able to describe how changing life-styles have affected the nutritional well-being of today's society.

FN-2 Using appropriate laboratory tests, the student will be able to identify the nutrients found in various food samples.

FN-3 The student will be able to describe the importance of calories to nutrition and how these calories are measured.

FN-4 Given various food labels, the student will be able to distinguish the foods having the greatest nutritional value.

FN-5 The student will be able to distinguish between nutritional facts and food fads and fallacies (fiction).

FN-6 Given instruction in food additives and their use, the student will be able to describe ten major food additives in terms of what foods they are used in, why they are used, their function in the food, and major concerns for their use.

FN-7 The student will be able to describe the role of the food industry in controlling the quality of food we consume and measures that consumers might take to control the loss of food quality in their diets.

FN-8 The student will be able to describe how obesity, hypertension and other disorders, prevalent in the black population, can be minimized by good eating habits.

FN-9 The student will be able to construct a plan which can be used in establishing a sound nutritional policy to prevent or control one of the major nutritional problems confronting the citizens of D.C..

SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-1 The student will be able to describe how changing lifestyles have affected the nutritional well-being of today's society.

SKILL: Communicating, Collecting data

MATERIALS:

Contact one of the following agencies to schedule a lecture/ presentation on the above topic:

(1) D.C. Dietetic Association

(2) D.C. Public Schools Food Service Association (Flossie Hill)

RATIONALE/BACKGROUND INFORMATION:

The following concepts should be emphasized for this objective:

I Ways in which eating habits have changed:

(a) Technological progress has altered the types of food we eat - more junk foods, processed foods, fast foods, convenience foods, etc.

(b) Technological progress has altered the preparation of foods - less time is spent in cooking, etc.

(C) Social and economic conditions have led to an increased force of working mothers - therefore less time is spent in obtaining and preparing foods.

(d) There are many new leisure activities available to all persons, therefore, less time is spent in obtaining, preparing, and eating foods.

II. The nutritional effect of the changing eating habits:

(a) Continual diet of fast, junk, processed and convenience foods does not provide adequate nutrition.

(b) Diet-related deaths comprise about one half of all deaths in U.S.

(c) Today's society is faced with a growing number of diseases and disorders which can be associated with these poor eating habits.

(1) hypertension

(2) diabetes

(3) heart diseases

(4) obesity

ACTIVITIES:

1. Have students conduct a survey on the eating habits of three older persons in their community (persons should be at least 50-60 years old and able to recall eating habits of at least 30-40 years ago). Following the survey, have the students compare their data on past eating habits with our eating habits of today to determine how eating patterns have changed. Listed below are possible questions which can be used in comparing past and present eating habits:

   1. (a) What types of foods that you eat now were not available to the persons you interviewed?

      (b) Why weren't these foods available?

   2. (a) How did most of the persons you interviewed get their food (from a store, from a farm)?

      (b) How are these methods of obtaining food different from the way(s) you get your food?

   3. (a) Did the people you interviewed have to spend as much time cooking their meals as your mother does now?

      (b) Why is this so?

2. Have a guest speaker from one of the organizations listed above (or on the Resource List) address the class on how eating habits have changed over the past 30-40 years as well as the affects those changes have produced on the nutritional well-being of todays' society.

3. Conduct a lecture/discussion summarizing information gained from surveys and guest speaker. Be sure to cover all concepts mentioned in Background Information.

ASSESSMENT TASKS:

1. Describe at least two changes in today's life styles (of technological origin) that have affected the nutritional well being of today's society. Explain how your eating habits have changed as a result of these technological changes.

2. List at least 5 ways in which eating habits have changed since our grandparents time. Describe conditions that exist today that could be responsible for these changes.

3. Describe three problems of national concern, that exist today and are attributed in part or whole to changed eating habits.

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-2 Using appropriate laboratory tests, the student will be able to identify the nutrients found in various food samples.

SKILLS: Interpreting data, Classifying

MATERIALS:

-- reference book(s) on nutrients
-- assortment of foods: bread, cheese, hotdogs, beans, eggs, meat, potato, carrot, apple, dry cereal, fruit juices etc. (make certain that you have goods from each nutrient class)
-- iodine solution, biuret solution, benedicts solution, indophenol brown paper bags, test tubes, bunsen burners, silver nitrate solution, test tube markers, breakers (400ml).

RATIONALE/BACKGROUND INFORMATION:

This objective is devoted to the student's understanding of the nutrients present in various foods as well as the function(s) performed by these nutrients. It is hoped that by the time the student reaches the 10th - 12th level, he/she will have had sufficient exposure to the basic concepts of nutrients (types of nutrients as well as functions) to enable him to go directly to testing various food substances for the presence of these nutrients. However, it will probably be necessary to conduct a review on the basic concepts

mentioned above. Accordingly, the first activity in this triad is suggested for this purpose.

ACTIVITIES:

1. With the use of reference book(s), have students review the classes of nutrients, function(s) of each class and possible food sources. Below is a suggested table format for efficient organization of the information.

NUTRIENT CHART

CLASSES OF NUTRIENTS	FUNCTION(S)	FOOD SOURCES (Name Three)
1. Water		1. 2. 3.
2. Fats		
3. Minerals (Name 4)		
4. Vitamins (Name 5)		
5. Proteins		
6. Carbohydrates		
A. Sugar		
B. Starch		

2. Have your students test various foods representative of all nutrient classes for detecting the presence of water, fat, minerals (salt), proteins, sugar, starch and vitamins (vitamin C). (Note: Greater detail on the testing procedures listed below can be found in: (1) Action Biology, Weinberg and Stoltz or (2) Focus on Life Science, Heimer and Lockard)

(A). Testing for Starch (Carbohydrate)

Bread contains starch which is one form of carbohydrate. To demonstrate this, place a small amount of bread into two test tubes.

To one test tube add a few drops of iodine solution, to the other some water. (Note: You may want to use this opportunity to review with students why they used this opportunity to review with students why they used two test tubes - one with water one without).

What happened to the bread in the iodine solution? Record the procedure you used (what you did) and your observations (what you saw) on your worksheet. Then, based upon your observation, mark the correct box under conclusions. Repeat this procedure for other foods given to you by your teacher. (Note: Dark blue-black color indicates low percentage of starch.)

(B). Testing for Sugar (Carbohydrate)

Raisins contain a high percentage of sugar. To demonstrate this, place about 5 or 6 raisins in 2 test tubes. This time, however, add a few drops of Benedict solution to one while adding water to the other. Heat both test tubes. What did you observe? Record your procedure and observation on your worksheet. Next, check the proper box under conclusion. Repeat this procedure for other foods given to you by your teacher. (Note: Read color indicates high percentage of sugar. Green color means low percentage of sugar).

(C). Testing for Fat

Oil is one food high in fat. To demonstrate this, place a small drop of oil on a piece of brown paper bag. Let the oil dry then hold the paper up to the light. Record your procedure and observations. Now check the appropriate box under conclusions. Repeat this procedure with other foods. (Note: the larger the spot, the greater percentage of fat.

(D). Testing for Protein

Egg white is almost pure protein. To demonstrate this, place egg white into two test tubes. To one test tube add about 10 drops of biuret solution, to the other add water. Record your procedure and observations. Again, record your conclusion by checking the right box. Repeat this procedure with other foods. (Note: if a high percentage of protein is present a dark purplish-red color results)

(E). Testing for Water

Most foods contain water. To demonstrate this, add a small amount of carrot to a test tube. Heat the test tube and carefully observe the top (upper) part of the test tube. Record your procedure and observations. Next, give your conclusion by checking the correct box. What do you think you would observe if the food you heated was made up of a lot of water?

(F). Testing for Minerals (Salt)

Salt (NaCl) is one type of mineral nutrient. To demonstrate its presence, place about 10 grams of a salt water solution in two test tubes. To one test tube add one drop of silver nitrate solution while adding water to the other. (Caution: Be very careful as silver nitrate is poisonous). Record your observations and procedure into your worksheet. Next, check the appropriate box under conclusion. (Note: A white cloudy color indicates the presence of a high percentage of NaCl)

(G). Testing for Vitamin (Vitamin C)

Most of you probably know that citrus fruits are high in Vitamin C. To demonstrate this, place a small amount of orange juice in 2 test tubes. To one test tube add a few drops (about 5-7) of Indophenol while adding water to the other test tube. Record your procedure and observations. Now check the appropriate box under conclusion. (Note: the fewer drops of Indophenol it takes to make the juice colorless, the greater the percentage of Vitamin C.) Repeat this procedure with other fuit juices and foods.

NUTRIENT WORKSHEET

Food	Nutrient Test Performed	Procedure	Observation	Conclusion: Nutrients Present: Starch	Sugar	Fat	Protein	(salt) Mineral	Water	Vitamin C	Job(s) Performed In Body
(1) Bread	(A) Starch	(A) Added iodine to bread	(A) bread turned dark black-blue	X							
	(B) Sugar	(B) added benedict solution to bread	(B)etc.								
	(C) Fat	(C)	(C)								
	(D) Protein	(D)	(D)								
	(E) Minerals	(E)	(E)								
	(F) Water	(F)	(F)								
	(G) Vitamin	(G)	(G)								
		(H)	(H)								
(2) Hot dog											

144

Note: (1) If time and material permits, you should allow the students to perform all of the nutrient tests for each food substance.

(2) In completing the portion of nutrient worksheet entitled conclusion, the following symbols can be employed:

X - large amount of nutrient present
x - small amount of nutrient present
0 - none of nutrient present

(3) To complete portion of table entitled "Job performed in body", allow students to refer to charts completed in Activity 1.

ASSESSMENT TASKS:

1. (1) Multiple Choice

(A.) Which of the following foods contains the most starch?

(1.) Bread

(2.) Cheese

(3.) Beef

(4.) Pears

(B.) Raisins contain a great amount of which nutrient?

(a.) starch

(b.) protein

(c.) sugar

(d.) fats

(C.) Which of the nutrients below would you expect to find in most fruit juices?

(1.) Vitamin D

(2.) Vitamin C

(3.) Starch

(4.) Fats

(D.) French fried potatoes contain a large amount of which nutrient?

(a.) Vitamin C

(b.) protein

(c.) sugar

(d.) fat & oils

2. Matching - Match the correct nutrient(s) in Column A with the appropriate food in Column B.

Column A	Column B
A. Fats	____1. Bread
B. Starch	____2. Cheese
C. Sugar	____3. Raisin
D. Protein	____4. Oil
E. Vitamin C	____5. Hotdogs
	____6. Molasses
	____7. Egg White
	____8. Oranges
	____9. Beef
	____10. Wheaties (cereal)
	____11. McDonald's French Fries

(Note: In doing this assessment task, food samples in Column B should have been tested during laboratory exercises.)

3. Multiple Choice:

A. Upon heating, a food sample to which benedict solution has been added turns brick red; which one of the following statements is true?

(1.) The food sample contains starch.

(2.) The food sample contains protein.

(3.) The food sample contains sugar.

B. If you add iodine solution to an unknown food sample the sample turns blue black; which one of the following statements is true?

(1.) The sample contains starch.

(2.) The sample contains vitamin c.

(3.) The sample contains sugar.

C. If you add 10 drops of Indophenol to an unknown yellow solution, the solution becomes colorless; which one of the following statements is true?

(1.) The sample contains a fat.

(2.) The sample contains protein.

(3.) The sample contains vitamin c.

D. If you place potato chips in a brown bag and an oily stain results, which one of the following statements is true?

(1.) The sample contains vitamin c.

(2.) The sample contains fat.

(3.) The sample contains protein.

SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-3 The student will be able to describe the importance of calories to nutrition and how these calories are measured.

SKILLS: Communicating, Collecting and Interpreting data

MATERIALS:

-- reference books on calories

-- tin can calorimeter

-- array of nuts (almonds, pecans, walnuts, etc.)

ACTIVITIES

1. Have students use reference books on calories to complete the following exercises:

   1. (a) Write the definition for calorie.
      (b) Why are calories important to the study of nutrition?

   2. (a) Do all nutrients contain calories?
      (b) If your answer is no, then what nutrients do not have calories?
      (c) Why don't they have calories?

   3. What do calories measure?

   4. What is a calorimeter?

   5. Explain or describe what a scientist does in measuring the amount of calories found in a food sample.

II. Have students demonstrate how calories are measured by determining the amount of calories (heat energy) given off by burning various nuts (one at a time) in a tin-can calorimeter.

For detailed explanation of the procedure for this lab activity you may wish to refer to one of the following listed sources:

(1) Weinberg and Stoltze, Action Biology: Teacher's Guide, pp. 25-26.

(2) Miller, Rosenberg Stackowski, Investigating Your Health, "Chapter 5 - Nutrition", pp. 111-113.

III. Have the students record the food they consume as well as the activities they carry out over a three day period. (Inform them that the amount of food eaten as well as the actual time spent in the activity must be recorded)

Once the data has been collected, have your students use the Calories and Activities chart as well as the Table of Calorie Values in Common Foods to calculate and compare daily calorie intake and output. (Note: the charts listed above can be found in the pamphlet "Food and Your Weight," available from the Department of Agriculture)

A suggested topic for discussion based upon this activity might be the relationship of calories to weight control.

ASSESSMENT TASKS:

1. Describe step by step a method used to determine the amount of calories present in any food sample.

2. Explain why it is important to know about calories.

3. (a) Describe what you would do to determine your daily calorie needs and calorie intake.

   (b) Why is it good to know your daily calorie intake and output?

   (c) If a person routinely consumed approximately 3000 calories per day while burning up around 2000 calories per day, describe what condition might eventually come about as a result of this calorie inbalance.

   (d) If a person routinely consumed approximately 2000 calories a day while burning up 3000 per day describe what condition might result.

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-4 Given various food labels, each student will be able to distinguish the foods having the greatest nutritional value.

SKILL: Interpreting data

MATERIALS:

-- reference material on food labeling
-- food labels and prices from an array of foods (meats, vegetable, etc.)

ACTIVITIES:

1. Using various references on food labeling as well as a sample food label, complete the following activity:
   a. Which agency is responsible for ensuring that proper labeling techniques are used by the food manufacturers?
   b. Make a list of the items of nutritional information that food manufacturers are required to include on the label of their particular product.
   c. Why is it important to know how many calories are present in the food? the amount of nutrients present?
   d. What is the U.S. Recommended Daily Dietary Allowance (U.S. RDA) and explain why it is important to know the RDA of various nutrients.
   e. Given the price of the food and a food label which tells you the number of servings in that food, how would you figure out the amount one serving would cost?

2. Based upon the information printed on various food labels provided by your teacher; answer the following questions. (Note: you should answer these same questions for at least five different labels):
   a. Record the name and price of the product.
   b. Which nutrients on the label would supply you with the highest percentage of the U.S. RDA? second highest percentage of U.S. RDA?
   c. How many calories are in one serving of this food?
   d. What is the cost of one serving of this food?
   e. What food additives are present?
   f. Would you consider this food to be a good nutritional source? why or why not?

3. Have the students compare the nutritional information from the labels of three foods belonging to the same food group (i.e., three vegetables, three meats, etc.) and answer the following questions:
   a. (1) Which nutrient is most abundant in all three samples?
      (2) Of the three labels, which food contains the largest U.S. RDA of that nutrient?
   b. Which food has the lowest cost per serving.
   c. Which food has the least additives present?
   d. Which of these foods would you consider to be the best nutritional buy for the price asked? Why?

ASSESSMENT TASKS:

1. Answer the following questions based upon the food labels listed below.

a. **ORANGE JUICE**

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 8

CALORIES.....60
PROTEIN.....1 gm
CARBOHYDRATE 13 gm
FAT.....0 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN.....0
VITAMIN A.....4
VITAMIN C.....90
THIAMINE (B_1).....6
RIBOFLAVIN (B_2).....0
NIACIN.....2
CALCIUM.....0
IRON.....0

PINK GRAPEFRUIT

NUTRITION INFORMATION
(per serving)
Serving size = ½
Servings per container = 4

CALORIES.....50
PROTEIN.....1 gm
CARBOHYDRATE 13 gm
FAT.....0 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN.....0
VITAMIN A.....0
VITAMIN C.....70
THIAMINE (B_1)..... .2
RIBOFLAVIN (B_2)... 0
NIACIN.....0
CALCIUM.....0
IRON.....2

a. Which of these products has the highest percentage of the U.S. RDA for Vitamin C? for Vitamin A?

b. How many calories per serving are there in (a) orange juice? (b) pink grapefruit?

c. Which product would you buy if you wanted to get the highest percentage of vitamins A and C?

2. ROAST BEEF (cooked)

NUTRITION INFORMATION

(per serving)
Serving size = 2 slices (3 oz)
Servings per container = 10

CALORIES.....190
PROTEIN.....26 gm
CARBOHYDRATE 0 gm
FAT.....8 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN.....50
VITAMIN A.....0
VITAMIN C.....0
THIAMINE (B_1).....2
RIBOFLAVIN (B_2).....10
NIACIN.....20
CALCIUM.....0
IRON.....15

PORK CHOP (cooked)

NUTRITION INFORMATION

(per serving)
Serving size = 1 chop
Servings per container = 4

CALORIES.....310
PROTEIN.....21 gm
CARBOHYDRATE 0 gm
FAT.....24 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN.....45
VITAMIN A.....0
VITAMIN C.....0
THIAMINE (B_1).....50
RIBOFLAVIN (B_2).....10
NIACIN.....25
CALCIUM.....0
IRON.....15

a. Which of these products has the most fat?

b. Which of these products gives the greatest amount of calories per serving?

c. Does roast beef or pork have the greatest percentage of U.S. RDA for protein?

d. If you were on a diet to control obesity and hypertension, which of the above foods would most likely be omitted from your diet? Why?

3. Answer the following questions based upon the food labels listed below:

41¢ PEAS

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 4

CALORIES	60
PROTEIN	4 gm
CARBOHYDRATE	9 gm
FAT	0 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN	6	NIACIN	6
VITAMIN A	10	CALCIUM	0
VITAMIN C	15	IRON	8
THIAMINE (B_1)	15		
RIBOFLAVIN (B_2)	4		

32¢ SPINACH

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 4

CALORIES	18
PROTEIN	2 gm
CARBOHYDRATE	3 gm
FAT	0 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN	2	NIACIN	2
VITAMIN A	100	CALCIUM	10
VITAMIN C	20	IRON	8
THIAMINE (B_1)	4		
RIBOFLAVIN (B_2)	8		

38¢ GREEN BEANS

NUTRITION INFORMATION
(per serving)
Serving size = ½ cup
Servings per container = 4

CALORIES	16
PROTEIN	1 gm
CARBOHYDRATE	3 gm
FAT	0 gm

PERCENTAGE OF U.S. RECOMMENDED DAILY ALLOWANCES (U.S. RDA)

PROTEIN	0	NIACIN	0
VITAMIN A	6	CALCIUM	2
VITAMIN C	10	IRON	2
THIAMINE (B_1)	2		
RIBOFLAVIN (B_2)	4		

A. Which food has the greatest % protein?

B. Which food has the greatest % of NIACIN?

C. Which food has the greatest total percentage of vitamins (A, C, B_1, B_2 & NIACIN)

SCIENCE AND SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-5 The student will be able to distinguish between nutritional facts and food fads and fallacies (fiction).

SKILLS: Communicating, Analysis

MATERIALS:

-- reference materials on nutritional fads and fallacies.

-- advertisements and articles from magazines and papers on current food trends.

ACTIVITIES:

1. Have students indicate whether the following statements are fact or fiction (Fad or Fallacy). After they finish, discuss the opinions which experts espouse on each statement with invoke disagreements, encourage more research on that topic.

    A. You should take some tomato or citrus juice daily.

    B. Oranges and lemons cause 'acid stomach'.

    C. You can't be healthy on a vegeterian diet.

    D. Milk helps build bones and teeth.

    E. You should take pills if you have 'tired blood'.

F. Everyone should take vitamin pills daily.

G. Expensive cuts of meat are more healthy than cheap cuts.

H. Safflower oil is good for reducing.

I. Cheese is hard to digest.

J. Most diseases are due to bad diets.

K. Being overweight is a serious problem in the U.S.

L. Most Americans eat too much protein.

M. Most Americans have too much fat in their diets.

N. Processing removes vitamins and minerals from foods.

O. Teen-agers need more calories than adults.

P. Brown eggs are healthier than white eggs.

Q. Food should be cooked in as little water as possible.

R. To lose weight, a person must eat less.

S. Large amounts of Vitamin C will cure a cold.

T. As much as possible, foods should be eaten raw.

U. It is harmful to cook in aluminum pots.

V. Overweight is related to heart disease.

W. Exercise makes you eat too much.

X. All fats affect your body the same way.

Y. You should eat meat each day.

Z. Fats have twice as many calories as carbohydrates (sugar and starches) and proteins.

(Note: The answers to these statements can be found in Action Biology, Teacher's Edition and "Eaters Almanac", Vol. 1, No. 1, Giant Food Inc.)

2. Have students read and report on 4 or 5 articles from magazines and newspapers on current food trends and ideas. This report should include a brief synopsis of the article as well as the students opinion as to whether or not the article promotes or fosters a good fad or fallacy. These reports should later be shared and discussed with the entire class.
3. Discuss with students the agencies and other resources which are available to help consumers determine if a food trend or idea is a fact of fallacy.

ASSESSMENT TASKS:

1. Select any ten of the Fact of Fiction statements from Activity 1 and have students indicate whether they are fact or fiction.
2. List at least ten synopses of articles on current food trends and ideas supplied by your students in Activity 2 and have students explain why they believe each article is either factual or promotes (fosters) food fads and fallacies.
3. Write a brief essay describing at least 2 things you could do in attempting to discover if a food trend or idea you have heard or read about is a fact or fallacy.

SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-6 Given instruction in food additives and their use, the student will be able to describe ten major food additives in terms of what foods they are used in, why they are used, their function in the food, and major concerns for their use.

SKILL: Communicating

MATERIALS:

- reference books and pamphlets on food additives; suggested titles and sources are as follows:

1. Focus on Food Additives

   Today's Food and Additives

   General Foods Consumer Center
   250 North Street
   White Plains, NY 10625

2. More Than You Ever Thought You Would Know About Food Additives

   U.S. Department of Health & Human Services
   Food and Drug Administration
   5600 Fishers Lane
   Rockville, MD 20857

3. Nutrition Foundation
   888 17th Street, N.W.
   Washington, D.C.
   872-0778

ACTIVITIES:

1. Use reference books and pamphlets to answer the following questions:

   a. What is a food additive?
   b. What is the difference between a direct (intentional) additive and an inderect (non-intentional) additive?
   c. Name at least two additives that come from natural sources.

      Name at least two additives that are man-made.

   d. Some people have said that all man-made additives are "chemicals" and are therefore harmful to the human body. Do you agree or disagree with this statement? Explain your position.

2. Have the students complete the following chart, using the reference materials available.

Additive	Reason for Use	Examples	Foods in which Additive is Used	Major Concerns re: Use
1. Antimicrobial		1. 2. 3.	1. 2. 3.	
2. Coloring Agent				
3. Leavening Agent				
4. Curing Agent				
5. Firming Agent				
6. Stabilizer				
7. Flavoring				
8. Emulsifiers				
9. Anti-oxidants				
10. Non-nutritive Sweetener				
11. Nutrient Supplement				

3. Have your students perform the four laboratory exercises listed below for the detection of the presence of various food additives in selected food samples. (NOTE: As only a brief description of the lab exercise is given below, please refer to the pamphlet, Experiments in the Chemistry of Foods, by Elbert C. Weaver, for a more detailed explanation and procedure.)

   a. Testing Bread for Calcium Propionate

      In this lab exercise, students will be precipitating the propionate group in the form of ethyl propionate (easily detectable because of its distinct pineapple-like odor) by:

      1. adding sulfuric acid to a solution of partially dissolved bread in distilled water, resulting in propionic acid (C_2H_5COOH)
      2. and later adding ethanol to form the desired end product (ethyl propionate).

   b. Sulfur Dioxide in Foods

      In this lab exercise, students will be detecting the presence of sulfur dioxide (a preservative) in a sample of dried apricots by:

      1. first oxidizing a solution of partially dissolved apricots in distilled water (accomplished by the addition of hydrogen peroxide) to form SO_4.
      2. and precipitating this group by adding BaCl.
      3. finally, determining the mass of the sulfur dioxide in the precipitate formed and accordingly, the percentage of SO_2 used in the dried fruit.

   c. Discoloration of Fresh Fruit

      This lab exercise will allow the student to demonstrate the effect that vitamin C (ascorbic acid acting as an antioxidant) has on freshly cut slices of fruit which are exposed to the air.

d. Identification of Colors in Food

In this lab exercise, students will be extracting certified food colors from certain foods and identifying them in chromatography.

ASSESSMENT TASKS:

1. Choose one of the following additives and describe it in terms of--examples, foods in which it is used, and its function in these foods:

   a. nutrient supplement
   b. curing agent
   c. antimicrobial

2. Describe at least three major concerns that consumers have about the use of additives in the foods they consume.

3. Match the correct additive in column B with the appropriate definition or example in column A.

A	B
___1. Helps to make breads and pastries 'rise'.	A. Leavening agents
___2. Natural herbs and spices	B. Coloring agents
___3. Used in thickening up ice cream and jello	C. Antimicrobial
___4. Used by diabetics and others who must lessen their intake of sweets; these add artificial sweetness but few calories.	D. Emulsifiers
___5. Helps in preventing food poisoning (botulism)	E. Flavoring agents
___6. Enables two substances that ordinarily will not mix well, to become mixed and stay that way.	F. Non-nutritive Sweeteners
___7. Prevents undersirable change in color of fresh fruits when they are exposed to air.	G. Stabilizers and thickeners

** others may be added if needed.

SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-7 The student will be able to describe the role of the food industry in controlling the quality of food we consume and measures that consumers might take to control the loss of food quality in their diets.

SKILL: Communicating

MATERIALS:

- reference book(s) on food processing

ACTIVITIES:

1. Plan a field trip to a food processing plant so that students may get first-hand experience concerning the preparation of foods for the consumer market. Have each student write a short description of the trip.

2. Divide the class into four groups and have each group research one of the following methods of food processing:
   -canning
   -freezing
   -drying
   -freeze-drying

   The research should include:

   a. A brief description of the stages or steps involved in each processing method.

b. The names of some major firms or companies which utilize that form of processing.

c. A description of how the food is changed or altered as it is being processed.

d. A list of advantages and disadvantages of processing in terms of maintaining the highest nutritive value of food.

e. A list of foods which are manufactured by the various processing methods.

Once the research has been completed, each group should present its information to the class. The teacher should help in compiling all major points in a classroom chart. Below there is a sample classroom chart:

Processing Foods-The Effect on Food Quality

Method of Food Processing	Steps Involved What is done to the food	How is food changed	Advantages of Processing	Disadvantages of Processing
1. Freezing				
2. Canning				
3. Drying				
4. Freeze-Drying				

3. Have students conduct research on natural and organic foods. Following the research, stage a debate on the question "do natural foods have greater nutritive value than processed foods?"

4. Discuss the tremendous impact that advertising has on the selection of the types of food that consumers buy, and consequently the quality of food they consume. Listed below are some suggested activities to illustrate how advertising influences the buying habits of consumers in the food market.

a. Recite or sing the opening lines to a catchy food advertising jingle and ask how many of the students can complete it. Also determine how many of the students have actually tried the product and their reasons for buying that product. Discuss the implications of the class' findings.

b. Bring in some cola (all the cola should belong to the same brand) and distribute in three containers. Label the containers-A,B, and C and inform the class that you are conducting a taste preference test. Further inform them that each container has a different brand of cola-- container A, the most expensive brand, container B, a moderately priced brand, and container C, the least expensive brand. Ask them to drink the samples offered from each and list them in order of preference. Discuss with students the implications of their findings.

   (NOTE: In previous tests, a few persons have stated that all the samples tasted the same; however, many actually preferred one sample over the others.)

c. Have students research the question "should food advertising on television for small children be curtailed?" Once research is complete, assign the roles of food advertisers and consumers to various students to present the varying viewpoints.

5. Have students compile a list of various federal and local agencies and organizations which are responsible for insuring a safe and pure food supply. A sample format is listed on the next page.

Agency or Organization	Responsibility of Agency	Problems the Agency Handles
I. Government Agencies		
A. Food and Drug Administration	A. Enforces regulations concerning the processing, labeling and marketing of foods and drugs.	A-1 Foreign substances (glass) found in food A-2 False or misleading food labeling
B. Dept. of Agriculture		
II. Organizations		
A. Nutrition Foundation		
B. World Health Organization		

6. Based upon the student discovered disadvantages associated with processed as well as natural foods, along with the list of watchdog agencies and organizations, have students generate a list of:

   a. the things that they can do to prevent or control their intake of poor quality food.

   b. the things that consumers can do to improve the quality of food on the food market.

ASSESSMENT TASKS:

1. Choose one of the following methods of food processing and describe it in terms of--the steps involved, companies that utilize it, changes that result in food because of it, and some foods manufactured by the method.

    a. canning
    b. freezing
    c. drying
    d. freeze-drying

2. Describe the impact of advertising on the quality of food that people consume.

3. Describe at least three measures that consumers can take to control the loss of food quality in their diets.

SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-8 The student will be able to describe how obesity, hypertension and other disorders prevalent in the black population can be minimized by good eating habits.

SKILL: Communicating

MATERIALS:

--reference books on nutritional disorders

--pamphlets from American Heart Association, Public Health Clinics, D.C. Dietetic Association etc.

INSTRUCTIONAL ACTIVITIES

(1) Have students utilize area resources (American Heart Association, Commission on Food, Nutrition and Health - Mayor's office, etc.) to prepare a report on one of the nutritional disorders prevalent in the black population. Emphasize that the report should include the following information.

(A) Nature of the disorder -
What is it, what causes the disorder, how does the disorder affect the body, what are some of the symptoms associated with the disorder.

(B) Explanation as to why the disorder is prevalent among black people - identify specific eating habits and foods which contribute to the disorder.

(C) Description of exercise programs and eating habits advocated or suggested by qualified persons (doctors, nutritionists) which help to prevent and control the disorder.

(2) Have students give an oral presentation of the reports.

(3) Have students record the foods they eat for two or three

days to evaluate their current diet or eating habits in terms of prevention and control of hypertension and obesity.

(4) Have students discuss the role of high fat intake as a major contributor to obesity and hypertension and describe methods by which fat intake can be lowered.

ASSESSMENT TASKS:

1. a. Describe at least three, diet-related disorders which are prevalent in the black community.

   b. Describe the types of foods that are often found in the diets of many black families which contribute to hypertension and obesity.

   c. Describe and explain how good eating habits can minimize

      1. obesity
      2. hypertension

2. Write a short essay (2 or 3 paragraphs long) describing an exercise program and a diet (eating habit) which you should or could follow for the prevention of hypertension.

3. Describe a diet that a doctor might prescribe for a person who is overweight.

SCIENCE AND SOCIAL ISSUES

ISSUE: FOOD AND NUTRITION

LEVEL: 10-12

OBJECTIVE:

FN-9 The student will be able to construct a plan which can be used in establishing a sound nutritional policy to prevent or control one of the major nutritional problems confronting the citizens of D.C.

SKILLS: Communicating, Problem Solving, Analysis

MATERIALS:

-- Contact the Mayor's Commission on Food and Nutrition to engage a member of the commission to present a lecture/ discussion of the nutritional problems of D.C.

-- Reference materials.

ACTIVITIES:

I. To allow the students the opportunity to get a feel for D.C.'s nutritional problems as well as what a nutritional policy or plan should encompass, invite a representative from the Mayor's Commission on Food and Nutrition to address the class on specific nutritional problems which exist in D.C. as well as the plan or action that the Commission has undertaken to remedy these problems.

Note: In preparation for the visit, have your students compose a list of questions to ask the guest speaker.

II. Have the students identify specific nutritional problems common to D.C. which they would like to do research on. A few of these problems are listed below:

(1) Teenage pregnancy and nutrition.
(2) Nutrition for the aged.
(3) Heart disorders (including hypertension) and nutrition.
(4) Junk foods in the schools.

Once the list has been completed; have the class break into committees, assigning one of the problem areas to each committee. Have each committee formulate a plan which would attempt to remedy the problem.

A. Determine the nature of the problem. (Identify specific conditions and disorders attributed to that particular nutritional problem.)
B. Conduct research - gather all available data on the problem as well as programs and plans which have already been instituted.
C. Formulate the plan. Each plan should include the following components:
    1. Introduction - This is basically a description of the problem - who does it affect, how does it affect them, what specific problems will you have to solve?
    2. Description of Plan - An explanantion of the plan and what it will attempt to do.
    3. Method of Implementation - How will the plan be put into action?
    4. Resources Needed - What will you need to get the job done? (not: a reasonable and effective plan will be one that uses the least resources to get the job done.)
    5. Evaluation - What criteria will be used to judge the success of the planned project?

ASSESSMENT TASKS:

1. Prepare a check list based upon the components of the plan that your committee designes. Give a check for each component which is completed.
2. Have students assess each other's plans, using a criterion check list, prepared previously by the teacher.
3. Construct a set of questions which need to be answered by anyone who is making a plan to control a social problem such as the nutrition problem you have just finished.

ISSUE: FOOD AND NUTRITION

SELECTED REFERENCES AND OTHER RESOURCES

BOOKS

1. White, R.B. Food and Your Future, Prentice-Hall Inc.
2. Weinberg and Stoltz. Action Biology, Allyn and Bacon Inc.
3. Heimler, Lockard. Focus on Life Science, Chap. 4, Charles E. Merrill Publishing Co.
4. Tanzer, Charles. Biology and Human Progress, Chap. 3, Prentice-Hall Inc.
5. Lawrence, Schriver, Powers and Vorhaus. Your Health and Safety in a Changing Environment, Chaps. 3 & 4. Harcourt Brace Jovanovich Inc.
6. Miller, Rosenberg and Stackowski. Investigating Your Health, Chaps. 5 & 6, Houghton Mifflin Co.
7. Whelan, Elizabeth M. Panic in the Pantry - Food Facts, Fads and Fallacies, Atheneum Publishing Co., 1975.
8. Hall, R.H. Food For Thought: The Decline in Nutrition, Random House Vintage Press, 1976.
9. Harris, R.S. and E. Karmas, editors. Nutritional Evaluation of Food Processing, AVI, 1975.
10. Hofmann, L., editor. The Great American Nutrition Hassle, Mayfield Publishing Co., 1978.
11. Inglett, G.E., editor. Fabricated Foods, AVI, 1975.
12. Sinclair, H. Modern Diet and Degenerative Disease: Just Consequences, edited by R. Waller & Charles Knight, 1971.

PAMPHLETS AND OTHER PUBLICATIONS

The pamphlets listed below are just a few of the publications offered by the respective organizations. In most instances, a classroom set maybe available upon request.

A. Department of Agriculture

1. Calories and Weight
2. Conserving the Nutritive Value in Foods.
3. Fats in food and diet
4. Food and Your Weight
5. Nutritive Value of Food
6. Nutrition: Food at Work For You
7. Nutrition Labeling - Tools for Its Use

Note: A catalogue of all Department of Agriculture publications is also available upon request.

B. Manufacturing Chemist Association

1. Food Additives: What They Are/How They Are Used
2. Food Additives - Who Needs Them
3. Experiments in the Chemistry of Foods

C. Dairy Council

1. Label it Nutrition

D. Nutrition Foundation

1. Obesity
2. Your Diet: Health is In the Balance
3. Nutrition Misinformation and Food Faddism
4. Choosing Foods to Fit Your Life
5. Nutrition and Numbers in the Third World

AGENCIES AND ORGANIZATIONS

1. D.C. Public School Food Services Assoc.
   Nutrition Education Division
   Flossie Hill 576-7404

2. Dairy Council
   7315 Wisc. Ave.
   Wash., D.C.
   Jean Clark 986-9113

3. Food and Nutrition Information and Educational Materials Center (FNIC)
   National Agriculture Library
   Beltsville, Md. 20705
   Robyn Frank (301) 344-3719

4. Commission of Food, Nutrition and Health - Mayor's Office
   122 C. St. N.W. Rm. 606
   Mrs. M. Brooks 727-1691

5. American Dietetic Association or D.C. Dietetic Association
   Wash., D.C.
   585-0437

6. Society for Nutrition Education
   Wash., D.C.
   543-0982

7. Manufacturing Chemist Assoc.
   1825 Conn. Ave. N.W.
   Wash., D.C. 20009

8. Center for Science in the Public Interest
   Nutrition Action Project
   1755 S. St. N.W.
   Wash., D.C.
   322-9110

9. Nutrition Foundation
   888 17th St. N.W.
   Wash., D.C.
   872-0778

10. Nutrition Consortuim
    2121 P. St. N.W.
    Wash., D.C.
    659-0088

11. Food and Drug Administration
    Wash., D.C.

12. Nutrition Institute
    Wash., D.C.
    Walter Mertz 344-2157

13. Consumer and Food Economics Institute
    Wash., D.C.
    R.L. Rizek 436-8457

14. U.S. Department of Agriculture
Commission on Food Consumption of Black Households
436-8596

15. Food Processors Institute
1133 20th St. N.W.
Wash., D.C. 20036
857-0890

16. Department of Agriculture Information and Publications Office
Wash., D.C.
Carole Plummer 447-2791

CONTROLLING ENVIRONMENTAL POLLUTION

RATIONALE

ISSUE: Controlling Environmental Pollution

The problems of environmental pollution are increasing in both kind and number. When the economy is in recession, it is more difficult to allocate capital expenditures to solving these problems. As the economy improves, the populace becomes more willing to make an attempt to improve the environment.

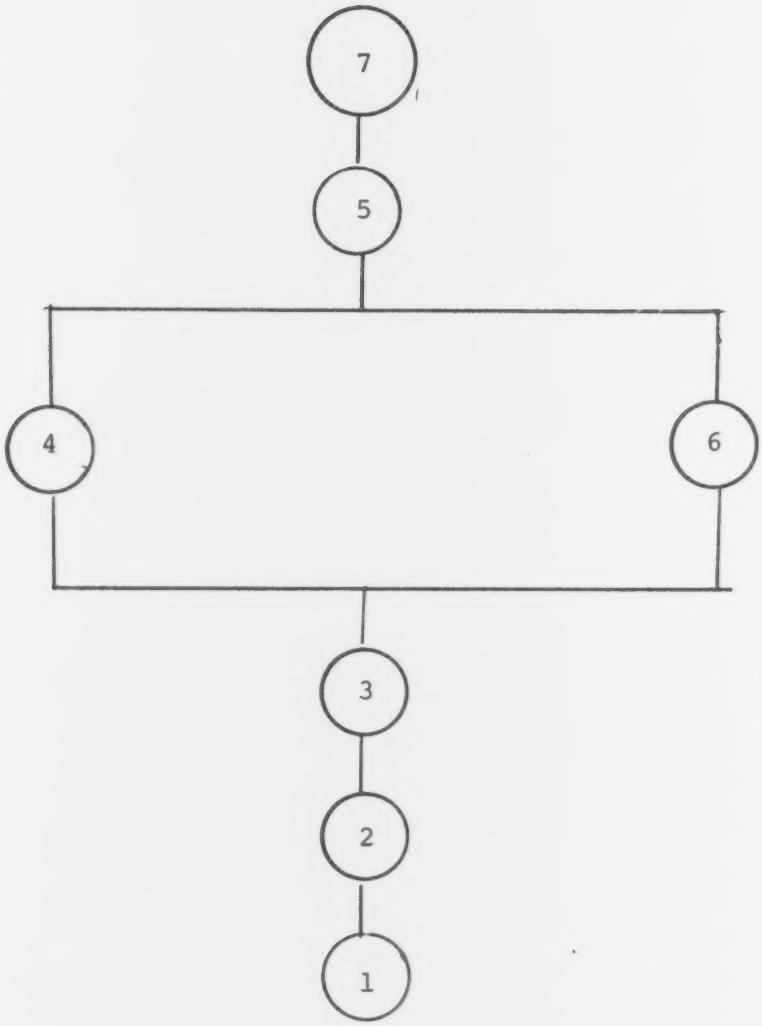
Students who are soon to be voters and concerned heads of families, need to be aware of the lessening quality of life and the role of community action in solving these problems. The actual participation in activities which give first hand knowledge about the pollution problems should help students to become personally interested in them.

Upon completion of this unit, each student will be able to:

a. Describe some of the causes of air, noise, water and solid waste pollutions.
b. Discuss some of the effects these types of pollution may have on living things.
c. Suggest some steps that might be taken to reduce these types of pollution.
d. Investigate the causes of the various kinds of pollution.
e. Express opinions about how pollution problems should be evaluated and solved.

CONTROLLING ENVIRONMENTAL SCIENCE

Hierarchy



182

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

OBJECTIVES

The Science and Social Issues student will be able to:

1. Describe pollution in terms of what it is, the five major types, and the most likely sources.
2. Given procedures used to collect evidence of pollution, demonstrate the presence of pollutants in the environment.
3. Describe the different pollutants in terms of source of pollutant, the effects upon the environment, and ways to abate and control them.
4. Describe the effects of pollution on one's personal health.
5. Describe environmental pollution control in terms of the laws or regulations used, the agencies responsible, and the effectiveness of the process.
6. Describe how population pollution can affect the external and internal environment of man.
7. Assist with the construction of a plan which can be used in the prevention of future environmental pollution in Washington, D.C.

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

LEVEL: 10-12

OBJECTIVE:

EP-1 The student will be able to describe pollution in terms of what it is, the five major types, and the most likely sources.

SKILL: Communicating

MATERIAL:

-- film
-- reference books
-- EPA pamphlets

ACTIVITIES:

1. Introduce this unit by showing a film on ecological problems. Contact EPA or D.C. Public Schools Media Center for such a film. In the opening discussion with your class, ask these questions:

   a. What do you think pollution is?
   b. What causes pollution?
   c. Is pollution harmful to your health?
   d. Is there pollution in your school-community?
   e. Does pollution cause damage to property?
   f. What is being done to control and prevent pollution?

NOTE: Suggested film-D.C. Media Center

Air Pollution P-1, Call # 2505
The Cities "A City Is To Live In", # 1995
The Third Pollution, # 1758

2. In the class discussion, establish a concrete definition of pollution (the one that EPA gives is sufficient). Explain that the five major types of pollution that will be covered in this unit are air, water, noise, radioactive and solid waste pollution.

3. Using the science book, reference books, and the EPA pamphlets, have the students generate a list of the usual sources of pollution. EPA will supply classroom sets of the needed materials when contacted in time.

   a. List at least fifteen sources individually or as a class unit, recording them on the chalkboard.
   b. From the list, have them identify those sources that are found around the school and in the community.

4. Have the students identify a single process or activity in each of their communities that causes the greatest amount of pollution. Have them justify why they think that it is the source of the greatest amount.

ASSESSMENT TASKS:

1. Define pollution and list the five major types to be studied in this unit.

2. Below is a list of the usual sources of pollution. In the blank beside each, write the type of pollution that is associated with that source.

   a. Exhaust fumes from autos_____
   b. Three-mile Island Nuclear Incident_____
   c. Sewage sludge_____
   d. Garbage_____
   e. Chemical waste_____
   f. Ore waste_____

g. Detergents_____

h. Rock concert_____

i. Factory _____

j. Airplanes_____

3. Name at least three sources of solid waste and noise pollution in your school.

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

LEVEL: 10-12

OBJECTIVE:

EP-2 Given procedures used to collect evidence of pollution, the student will demonstrate the presence of pollutants in the environment.

SKILL: Experimenting, Collecting and interpreting data

MATERIALS:

- vaseline
- lens
- filter paper
- vacuum cleaner
- water samples
- masking tape
- 4 cards, 7 cm x 13 cm
- absorbent cotton
- chips of paint, 7mm x 7mm (taken from an old painted surface at home or school)

ACTIVITIES:

1. Identification of solid pollutants.

   a. Use four cards, 7 cm x 13 cm. Put two strips of masking tape (sticky side out) along the length of each card. Mount each card on a dowel stick about 30 cm long with tape or tacks. Place one card on each side of the school building with the sticky side facing the wind. Mark the location on each card (North, East, South, West). Leave the cards in place for three days, then bring them into the classroom. Compare the cards for the type of material collected on each side.

-What sort of material did the cards collect?
-Did it make any difference on which side of the building the cards were placed?
-Do you think that the material collected could be classified as "smog"?
-Attempt to identify the particles as to source and investigate to determine if any are harmful to humans.

b. Coat a glass plate with a thin layer of vaseline (white petroleum jelly). Set it out on the window sill or roof of the school. Leave it for three days in dry weather, then examine it with a lens. Do the particles observed on the plate give any clue to their possible source? How do they compare with those found in a?

c. Place a piece of filter paper over the end of the hose of a tank-type vacuum cleaner. Turn on the switch and allow the motor to run for several minutes while holding the hose in mid-air. Stop the motor and examine the filter paper with a lens under a bright light. Compare what you see with the particles collected in parts a and b

-Explain any differences noted.
-Repeat the test indoors and outdoors several times at different hours and on different days.

d. Hold a piece of absorbent cotton over the exhaust of a car, with the motor running, for about five seconds. This could be done at school and on any car available. (Use caution around the car--do not breathe exhaust fumes.) Examine the cotton. Compare the deposit with the material collected in the activities above.

-Which material has a dusty odor?
-Which one has a sticky feel?
-Could you see either material while it was in the air?
-Can you determine which deposit is cause by nature and which is caused by machinery?
-Determine if either particle is harmful to humans and why.

CAUTION: This activity should be conducted under the supervision of the teacher or another responsible adult.

2. Water pollutants.

Obtain several samples of water from nearby ponds, streams and the Potomac River. Examine the water sample under a microscope. Would you consider water from these sources safe to drink? Why?

Evaporate several milliliters of each sample to dryness and observe the residue obtained. Ask a student to check with the local health department to find out what steps are taken to prevent contamination of the local water supply.

Locate a water pollution kit and have the students test the presence of designated pollutants such as copper, chlorine and phosphates.

3. Lead as a pollutant.

Paint chips from a piece of old window putty or other source can be tested for the presence of lead in the lab. CAUTION: Please do not use more than the suggested amount of chemicals.

Weigh out about 0.10g of the paint chips (a piece 2mm x 3mm, free of wood or other materials), and place the sample in a test tube. Add 3 drops of concentrated nitric acid, HNO_3, and place the test tube in a boiling water bath for 15 minutes. Heat it in a fume hood, if available, to avoid breathing the nitrogen oxide fumes. If there is no hood, try another classroom-- or the activity can be done as a demonstration by the teacher.

Remove the test tube and add $2cm^3$ of distilled water. If the paint is collected from a "gilded" radiator, it may contain interfering elements such as silver (Ag), thallium (Ti), or mercury (Hg). In this case, use a 1% sodium sulfite solution, Na_2SO_3, instead of water. Allow the test tube to stand undisturbed for ten minutes or until undissolved materials settle. Transfer the clear liquid to a clean test tube.

Place the test tube in a water bath at about 65^{o} for five minutes. Allow ten drops of a 20% potassium iodide solution, KI, to fall directly on the tube liquid. Do not shake the the test tube. If there is more than 1% lead in the original paint sample, a yellow precipitate of lead oxide, PbI_2, is immediately formed at this point.

4. Pollution walk-- Observations on a pollution walk.

   Take your class on a field trip around the school and in the community. Have each student fill in the observation sheet as he/she travels.

Observations on a Pollution Walk

Route of walk_____

Date_____

Weather conditions_____

Environmental Problems	Observed	Not Observed	Comments
1. Smog			
2. Exhaust fumes from cars, buses etc.			
3. People coughing			
4. People using insecticides			
5. Trash in streets, alleys			
6. Abandoned cars			
7. Open dump			
8. Unpleasant odors			
9. Heavy traffic			
10. Noisy autos, trucks, buses			
11. Noisy airplanes			
12. Noisy construction equipment			
13. Rundown building			
14. Rats, roaches, dead animals			
15. Deteriorating paint on buildings, cars			
16. Eroded banks, hills lawns			
17. Dirty streams			

ASSESSMENTS: Product Assessment

The assessments for this triad will be the evaluation of the experimental data in each of the four activities. Students should perform the activity, collect the data, record it, make interpretations and answer any questions asked. The paperwork should be passed in to the teacher for the evaluation.

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

LEVEL: 10-12

OBJECTIVE:

EP-3 The student will be able to describe the different pollutants in terms of the source of the pollutant, the effects upon the environment, and ways to abate and control them.

SKILL: Communicating

MATERIALS:

-pamphlets on pollutants from The Environmental Protection Agency, 401 M St., SW, Office of Public Inquiries, 382-7550.

-film- "Noise Presentation", National Information Center for Quiet, Box 57171, Washington, D.C. 20037.

ACTIVITIES:

1. Using the data results from EP-2, have the students examine each pollutant collected and suggest a source for each.

2. Using pamphlets and other resource materials, have students determine the effects that the following pollutants have upon the environment.

   -solid waste pollutants
   -water pollutants
   -air pollutants
   -noise pollutants
   -radioactive pollutants

   Have each student generate a list of at least three examples of each of the pollutant types listed above.

Have them offer ways to control the flow of each of these pollutant examples into the environment.

3. Take the class on a field trip into the school's environment. Divide the class into groups of five students. Equip each group with hand lens.

   a. Locate an area which contains plants, that is near a heavily traveled street or roadway. Have students carefully examine the leaves, flowers and stems of randomly selected plants for evidence of pollutants. Have them record their observations.

   b. Have them move 100 feet away from the area and again examine the plants. Have them do this at 500 feet, then 1000 feet distances from the street.

      -Is there any difference in the evidence of pollutants observed at each distance?
      -Suggest a source for this pollution.
      -Do you observe any differences in the appearance of the plant life at the various distances?

   c. Have students discuss ways to control the pollution flow in the area.

4. Show the class the film "Noise Presentation"; it is available for loan from the listed source at no charge. Discuss the sources of noise pollution presented in the film.

   a. Noise is measured in decibels by a sound level meter. Using a sound level meter, determine the levels of noise in different areas of your school-- classroom, cafeteria, hallways during lunch, office.
      Identify the major sources of noise in your school.

      Compare the levels that you measure with those displayed on the Decibel thermometer in the pamphlet, Think Quietly About Noise, available from EPA, Office of Noise Abatement and Control.
      Chart your results and display them as a class project.

   b. Discuss the relationship between noise pollution and other environmental pollutants. Are there any sources that are responsible for more than one type of pollutant?

   c. In a class discussion, have students suggest some ways to control noise pollution, as individuals, families, and a community. (See EPA publication, Preparing For

A Quieter Tomorrow, Section VII- "Regulation and Control of Noise".

d. Discuss the economic impacts associated with high noise levels in working and living environments.

Bring in situations such as the following:

- purchasing a home near a very heavily traveled airport
- living in an apartment over a pub/disco joint
- costs to companies to meet government requirements that protect the health of employees who work under conditions of high noise levels
- subway systems whose vibrations damage the streets and buildings of cities

ASSESSMENT TASKS:

1. Please select one of the types of pollution listed below and describe it in terms of examples of pollutants and their effect upon the environment.

   a. solid waste pollutanta

   b. noise pollutants

   c. air pollutants

2. Describe briefly, one way in which pollution has caused great damage to your community.

3. Describe some measures that are utilized or can be utilized to abate and control pollution,

   - in your home
   - in your community
   - in your state

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

LEVEL: 10-12

OBJECTIVE:

EP-4 The student will be able to describe the effects of pollution on one's personal health.

SKILLS: Communicating, Interpreting data

MARERIALS:

-reference books
-EPA pamphlets
-newspaper articles, magazine articles

ACTIVITIES:

1. Using the textbook, EPA pamphlets and other reference materials, have the students compile a list of health problems that are:

   a. caused by pollution
   b. aggravated by pollution

** (The EPA pamphlet, "Protecting Our Environment" March, 1977, can be used for this activity.)

The following list can be utilized as a supplement to the one compiled by the students.

Type of Pollution	Disease-Health Problems
Air	asthma, common colds, pneumonia, lung cancer, bronchitis, respiratory disorders, diseases of the heart.

** NOTE: follow up this research with a thorough class discussion for clarity and understanding.

Type of Pollution	Disease-Health Problem
Noise	hearing loss, learning problems, sleep disruption, interference with conversation and social interactions, effects on unborn child, interference with mental and physical activities, production of anxiety and stress.
Water	Virus hepatitis, typhoid, lead poisoning, diptheria.
Toxic Substances	may cause cancer, birth defects, nerve damage, genetic mutations.
Radiation	skin burn, skin cancer, cataracts, neurological and behavioral changes.
Solid Waste	emitted gases may aggravate existing bronchial problems; worm infestations.

2. Have the students go to the library and use newspapers and magazines to research incidences of solid wastes which were buried underground and later seeped up to the surface to cause health problems for communities (ex. The Love Canal case).
Identify specific health problems attributed to pollution.
Through class discussions, deal with such issues as:
   - who is responsible for the repair and/or clean-up?
   - do residents have legal recourse to be compensated for any damages that they suffer?

ASSESSMENT TASKS:

1. Describe the effects that air pollution could have on the health of the residents of the District of Columbia.

2. Write an essay on the topic "Teenagers and Noise".

   -identify at least three sources of excessive noise exposure for teenagers.

   -describe possible short term and long term effects of this noise exposure.

   -indicate some preventive measures that can be taken to minimize these effects.

3. Describe three ways in which pollution can effect your personal health.

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

LEVEL: 10-12

OBJECTIVE:

EP-5 The student will be able to describe environmental pollution control in terms of the laws or regulations used, the agencies responsible, and the effectiveness of the process.

SKILLS: Communicating, Interpreting information

MATERIALS:

-Reference materials for federal and state laws
-EPA pamphlets on pollution control

RATIONALE/BACKGROUND INFORMATION

Many students will mistakenly assume that we can control pollution by setting up various agencies and by passing laws. This simply isn't true. However, students should have first-hand knowledge of how environmental control agencies work and how laws are developed, their effectiveness, and whether or not they are being enforced. The primary purpose of these activities is to help students become more aware of the functions of these agencies and laws.

ACTIVITIES:

1. Have students research the legislative acts that regulate environmental pollution control and discuss thoroughly their content.
(A listing is provided after activity 3)

2. Explain to the students that there are many agencies that are responsible for the control of pollution. This activity is designed to develop awareness of and knowledge about the functions of these agencies.

   The eight agencies that share the responsibility of control are listed below. Divide the class into small groups and assign an agency to each. Have them research and report on the agencies and their functions.

   -Environmental Protection Agency
   -Department of Human Resources
   -Department of Environmental Services (D.C. Gov't.)
   -Council of Governments
   -Solid Waste Reduction Center
   -Federal Energy Regulatory Commission
   -Environmental Quality Council
   -Concern Incorporated

   All of these agencies are listed in the telephone directory for the District of Columbia. The first seven are listed with the city or federal government listings and the eighth is listed as a business or professional organization.

   If possible, have the students visit the agencies after making contact and determining who to see and where to go, to obtain first-hand information through the interview process.
   Have them report orally to the class but submit a written report also.

3. Using the provisions of the Acts as guidelines, develop a number of problem situations that involve the violation of the acts. Present these to the students and have them determine which act is being violated.

   Ex. A barge carrying oil overturns in the Chesapeake Bay, creating an oil spill that moves inward toward the beach area. (Water Quality Acts is violated)

FEDERAL LAWS RELATING TO POLLUTION

Title of subject area:	Provisions
River and Harbor Act (1899)	The act makes it a criminal offence to dump any sort of material that interferes with navigation into a river or harbor. Provides for a fine (not to exceed $2500) and/or imprisonment of up to one year for each violation.
Water Quality Acts	The Water Quality Act of 1965 requires all of the states to set water quality standards and have them approved by the federal government. It requires that all water discharged by industries should, by 1973, undergo at least "secondary treatment." The Federal Water Pollution Control Act of 1970 amended the first act and established a national policy for the prevention, control, and abatement of water pollution. This act provides funds for: (1) water pollution control programs, (2) grants for research, (3) development and construction of treatment plants, (4) enforcement measures, and (5) control of oil spills and sewage discharges from vessels.

	The Federal Water Pollution Control Amendments of 1972 call for the use of the best practical control technology by 1977 and the best available control technology by 1983.
Clean Air Acts	The Clean Air Act of 1977 amended the 1967 Air Quality Act and empowers the federal government to protect and improve the nation's air resources and the public health and welfare. Some actions taken under the act are the controlling of emisions from new automobiles, setting air quality standards, and encouraging and developing emission standards for new industries built anywhere in the United States.
Noise Pollution and abatement Act of 1970	Provides for a study to identify and classify causes and sources of noise problems and to determine their effects on human health and welfare. The Solid Waste Disposal Act of 1965 and the Resource Recovery Act of 1970 provide funds for demonstration projects, resource recovery systems, the training of personnel and planning including a comprehensive plan for

	the storage and disposal of radioactive materials, toxic chemicals, and dangerous biological materials. There are no control, enforcement, or penalty provisions in these acts.
National Environmental Policy Act (1969)	Requires all proposed federal projects to be evaluated for their impact upon the environment before being carried out. These evaluations are put into a report circulated to all United States government agencies for review and comment. Each agency must publicly file its position on the proposed project. The conditions of this act have already influenced many projects and caused the redesign of others in order to reduce their impact on the environment.
Occupational Safety and Health Act (1970)	Provides for protection of the person in the working environment. It sets standards and criteria for various industrial activities and also sets penalties for violators. The Act covers, among other things, standards for human

exposure to gases, vapors, aerosols, and noise, and standards for the installation and use of safety guards, ladders and other safety equipment.

4. Using pamphlets such as'Water Pollution Causes and Cures' and'Solid Waste Pollution Causes and Cures', have the students discuss problems that relate to conflicts such as the following:

   -How can a water treatment plant such as Blue Plains, under the direction of the Department of Environmental Services, cause air or solid waste pollution, while trying to control water pollution?

   Identify other such conflicts from the reading and present these for discussion.

5. As the students visit agencies that are responsible for pollution control, have them explore the effectiveness of the control process. Have them discuss with their contacts, at these agencies, cases of violations and what was done about them.

   Using the incidences of solid waste seepage that they found in EP-4, activity 2, have them find out what resolutions, if any, occurred as a result of attempts to prosecute for violations.

   Have them locate instances where litigation is still in process and research the history of the cases as they move through the litigation process.

   Have them investigate the effectiveness of control measures such as the catalytic converter on vehicles to reduce the emission of exhaust fumes; are these still being placed on new cars? Are checks made by the Department of Motor Vehicles to determine if motorists keep them on their cars? What happens to a motorist who decides to remove the converter and is discovered by the law?

   Identify other such situations as they arise in the reading and discussion and use them as points for discussing the effectiveness of control measures.

ASSESSMENT TASKS:

1. Describe the pollution control measures used by two of the following agencies:

   -EPA
   -Department of Environmental Services (D.C. Gov't.)
   -Federal Energy Regulatory Commission
   -Environmental Quality Council

2. Match the incidences of pollution in column I with the laws that they violate in column II. Place the alphabet representing the law or act in the blank opposite the incident.

I	II
____ release of radioactive materials from a power plant into the atmosphere	A. River and Harbor Act of 1899
____ release of heavy smoke and particles from a factory into the air on the outskirts of a major city.	B. Water Quality Acts
____ dumping junk cars into the Potomac	C. Occupational Safety and Health Act
____ release of liquid chemical waste by a factory into a river	D. Noise Pollution and Abatement Act
____ an airport using a flight pattern, for landing jet airplanes, that goes over a residential area	E. Solid Waste Disposal Act of 1965
____ a company refuses to make make provisions for the welfare of its employees in terms of safety measures to protect them form excessive noise pollution	F. Clean Air Acts

3. Choose an incidence of pollution violation that you have discussed in class and describe the effectiveness of the control process in dealing with it.

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUTION

LEVEL: 10-12

OBJECTIVE:

EP-6 The student will be able to describe how population pollution can affect the external and internal environment of man.

SKILLS: Communicating, Interpreting data

MATERIALS:

-chalk, meter stick,metric ruler,
-6 oranges

ACTIVITIES:

1. Please have your students do the following:

   a. Measure a space at the front of the classroom or on the playground that is 2.5 meters on each side. Mark the boundaries with a chalk line. Have students go into the marked off space, one at a time, and sit on the ground or floor. When the area is completely filled, count the number of students inside the boundaries.
   Use the following questions for discussion:

   -How much living space does each child have?
   -Compare this with the population density of Washington, D.C. and Alaska.
   -Could people live in such crowded conditions?
   -What would be the disadvantages?
   -Would there be any advantages?
   -Would such crowding affect the way people get along?
   -Have you read about any places where such crowding is common?

b. Have the students crowd into a specific area for 30 minutes. The area should be small enough so that each person is touching. Conduct a class discussion in which students relate the feelings and emotions and anguish that they experienced while in the crowded situation.

2. Have two students equally share an orange. Then, have 15 students divide an orange equally. Finally, have the entire class share equally one orange. Again, have them share their feelings of frustration (if any), orally in class. Relate this to overpopulation, to food shortage as a result of overpopulation.

3. Contact the various health, social, and mental institutions to get information on how overcrowding affects your physical, emotional, and social well-being. Gather this information and package it so that it can be distributed to the students following or during a class discussion.

   -bring out the effects of overcrowding on both the internal environment of the student, i.e. emotional problems such as impatience, irritability, anger, frustration; feelings of claustrophobia; stress and hostility
   and
   -the effects on the external environment of the person, i.e., increase in filth and dirt, inadequate food and water supplies, agressive hostile behavior caused by not having enough of most things.

4. Have students identify areas in the community that show evidence of overcrowding.

   -generate a list of characteristics of these areas.
   -have the students offer suggestions as to how overcrowding could be alleviated.

ASSESSMENT TASKS:

1. Describe three ways in which overcrowding or overpopulation can affect the internal environment of people.

2. Describe at least three ways in which overcrowding or population pollution can affect the external environment of people.

3. Identify some strategies that urban communities use to prevent conditions of overpopulation/ overcrowding.

SOCIAL ISSUES

ISSUE: CONTROLLING ENVIRONMENTAL POLLUITON

LEVEL: 10-12

OBJECTIVE:

EP-7 The student will be able to assist with the construction of a plan which can be used in the prevention of future environmental pollution in Washington, D.C.

SKILL: Predicting

MATERIALS:

-all data and information gathered in the previous 6 objectives.

-all pamphlets and resource materials utilized in the 6 previous objectives.

RATIONALE:

Pollution control is not easily accomplished. It demands that cities and communities expend their talents, time and money. A greater problem than control is the prevention of future pollutin problems. The purpose of this objective is to give students a chance to peopose a workable plan for prevention of future pollution problems.

ACTIVITIES:

1. Make a list of industries in Washington, D.C. that, over a period of ten days, emit black or dark-grey smoke into the air. Ask a representative from one of these industries (possibly the one that appears to be the greatest offender) to speak to the class about that industry's problems.

Have the person explain what the industry is doing to correct the problem, and reduce the level of pollution.
After the industry's plan has been presented, have the class construct a plan of their own, as a class project. Be sure that they include charts, graphs, diagrams, budgets, time schedules, lists of committees, a description of social and political implications, etc.

***

2. Divide the class into groups of four to five students. Have them generate a list of ways in which citizen involvement in city and community affairs can facilitate the prevention of future pollution problems.

   Some possibilities are:

   -a knowledge of major construction to be approved and introduced into the community and a thorough understanding of the effects that this construction might have upon the lives and welfare of the inhabitants.

   -cognizance of and involvement in legislation whose passage might change or disrupt the environment.

   -mobilizing of community forces to fight any conditions and situations that may contribute to pollution.

3. Have the class carefully review the laws of Washington, D.C. that relate to the regulation of pollution. Have them identify any that would serve to prevent pollution problems. Have them suggest ways in which the existing statutes could be improved upon and ways in which they are or could be ineffective. Finally, have them ways or means of getting the statutes changed or new ones passed.

4. After completing activities 2 and 3, have the students review their plans and make additions and/or changes in light of what they have learned in these activities.

***NOTE: A suggested format for the class plan is as follows:

-identify the type or types of pollution to be included in the plan

-amass all necessary background information

-indicate any manpower needed

-list descriptions of the political and social implications

-identify any committees needed

-develop a time line/schedule for the development and implementation of the plan

-Apply the problem solving model, from DM 6, if possible

ASSESSMENT TASKS:

The assessment is an evaluation of the plan for prevention of future pollution. Be sure to check for the format criteria in the NOTE above and in activity 1.

Monitoring the planning process will reveal the level of involvement for each student.

The assigning of students to small groups to work on different components of the plan will assure specific contributions by each student.

Issue: Controlling Environment Pollution

Selected References

BOOKS

1. Rosenberg, Edward B., Gurney, Henry J., and Hurlin, M.D., Vivian K., Modern Health Investigations. Boston, Mass: Houghton Mifflin Company, Publishers 1979.

2. Rosenberg, Edward B., Gurney, Henry J., and Harlin, M.D., Vivian K., Investigating Your Health revised edition. Boston, Mass: Houghton Mifflin Company, Publishers 1979.

3. Bishop, Margaret S., Lewis, Phyllis G., and Sutherland, Berry. Focus On Earth Science. Columbus, Ohio: Charles E. Merrill Publishing Co. 1976.

4. Ramsey, William L., Gabriel, Lucretia A., McGuirk, games F., Phillips, Clifford R., and Waterpaugh, Frank M. General Science: New York, New York. Holt, Rinehart and Winston, Publishers. 1979.

5. Brenchley, David L. and Towler, John O. The Environment: Activities and Exploration. Hopewell, New Jersey: Houghton Mifflin Company, Publishers, 1975.

PAMPHLETS AND OTHER PUBLICATIONS

The pamphlets, journals and films listed below are some of the publications offered by the respective organizations. In most instances, a classroom set of the individual pamphlets as well as the organization's Catalogue of Publications will be available upon upon request.

A. Environmental Protection Agency - Office of Public Inquires-382-7550, 401 M Street, SW

Pamphlets:

1. Pollution: A Common Concern OPA 7618
2. Noise: A Health Problem
3. Pollution and Your Health
4. Your World, Your Environment
5. Fun with the Environment
6. The President's Environmental Youth Awards
7. Smog, Health and You
8. Cities: An Environment Wilderness
9. Measuring Air Quality: The New Pollutant Standard Index
10. Is your Drinking Water Safe
11. Do You Own A Car?
12. Noise - It Hurts!
13. Noise Around Our Homes
14. Noise At Work
15. Noise and Recreational Vehicles
16. Noise on Wheels
17. Clean Air the Breath of Life
18. Where Do We Go From Here? The Challenge of Water Quality Management for Elected Officials
19. Unleaded Gas: The Way To Go
20. Earth Trek ... Explore Your Environment

21. Career Choices

22. Environmental Field Trips - Some Places to Visit in Maryland, Virginia and the District of Columbia

Journals

EPA Journal Vol. 4 No. 5 May '78

EPA Journal April '78

Films

Air Pollution -EPA

Noise Presentation - National Information Center for Quiet, P.O. Box 57171 Washington, D.C, 20037

Pamphlets

1) Solid Waste Pollution Causes and Cures
2) Air Pollution Causes and Cures
3) Water Pollution Causes and Cures
4) ECO Action Before-After

Resources

Films from EPA 1

Contact EPA Office of Public Awareness

Free-loan, rental films

Resource Persons from EPA

Purpose: To show films

To give demonstrations

To give lectures & answer questions

To give tour of EPA department

To visit schools (D.C.P.S.)

The following reprints journals and pamphlets are available in classroom sets.

Requirements: Please call in advance for the following person to organize the package.

*Ms. Mattie Montgomery
Office of Public Inquiries
401 M St. SW
382-7550

NUCLEAR ENERGY

SCIENCE AND SOCIAL ISSUES

ISSUE: NUCLEAR ENERGY

LEVEL: 10-12

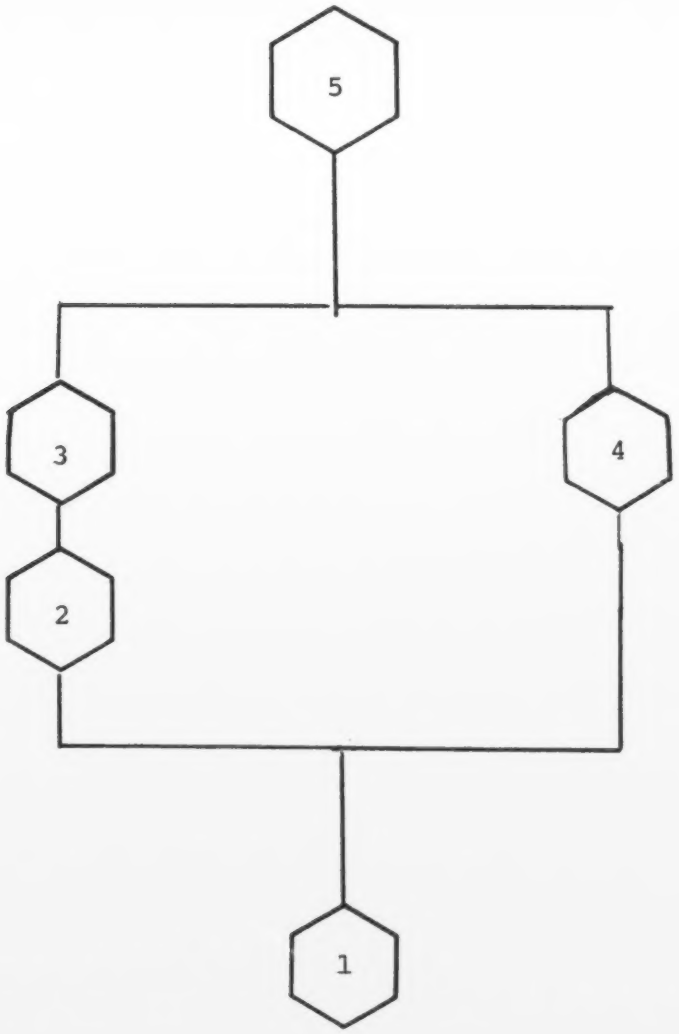
RATIONALE

With the explosion of the atomic bombs in World War II, man entered the nuclear age. Since then nuclear energy has been utilized for more constructive purposes in the areas of medicine, industry and research. As our conventional sources of energy dwindle man has also turned to nuclear energy as an alternate source of power generation. In fact, two nuclear generating plants are located little more than an hour's drive from Washington, D.C.

In this issue not only will students be exposed to the scientific principles involved in nuclear power generation and the risk involved, but will also be made aware of some of the other purposes for which nuclear energy is being used.

As young people approach voting age, they need to begin making value judgments about the use of nuclear energy which are based on the knowledge of the trade-offs involved rather than emotional reactions. This unit provides an opportunity to begin making such judgments.

NUCLEAR ENERGY HIERARCHY



217

SCIENCE AND SOCIAL ISSUES

ISSUE: NUCLEAR ENERGY

OBJECTIVES

The student will be able to:

1. Describe how the processes of fusion and fission are involved in the production of nuclear energy.
2. Describe how nuclear energy is converted to electricity in a nuclear power plant.
3. Describe four major types of possible risks associated with the use of nuclear power plants.
4. Describe four constructive uses of nuclear energy in today's society.
5. Construct a project which describes how the local community feels about using nuclear energy as a power source.

SOCIAL ISSUES

ISSUE: NUCLEAR ENERGY

LEVEL: 10-12

OBJECTIVE:

NE-1 The student will describe how the processes of Fusion & Fission are involved in the production of Nuclear Energy.

SKILL: Communicating

MATERIALS NEEDED:

Colored chalk, crayons

Student Handouts I & II

ACTIVITIES:

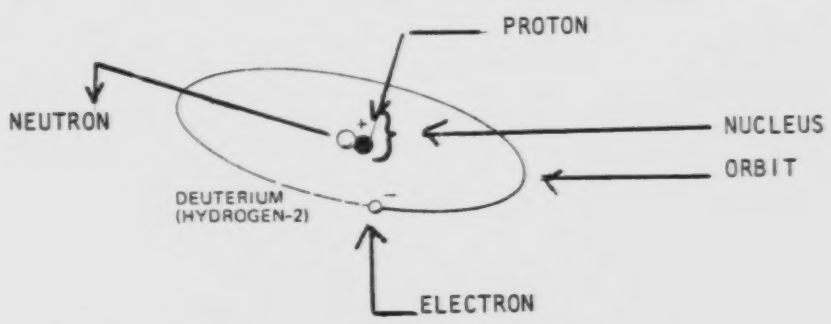
1. Conduct a brief classroom discussion to ascertain what students think nuclear energy is. Upon completion of the discussion give the formal definition.

   A. Nuclear Energy - is the energy released when matter is changed into energy. It is called NUCLEAR energy because the process of changing matter into energy occurs in the NUCLEUS of the atom.

   B. Place a diagram of the Atom on the blackboard and review its parts stressing the charge and location of the following basic nuclear particles:

      1. protrons
      2. neutrons
      3. electrons

   Note to teacher: The given diagram may be helpful.



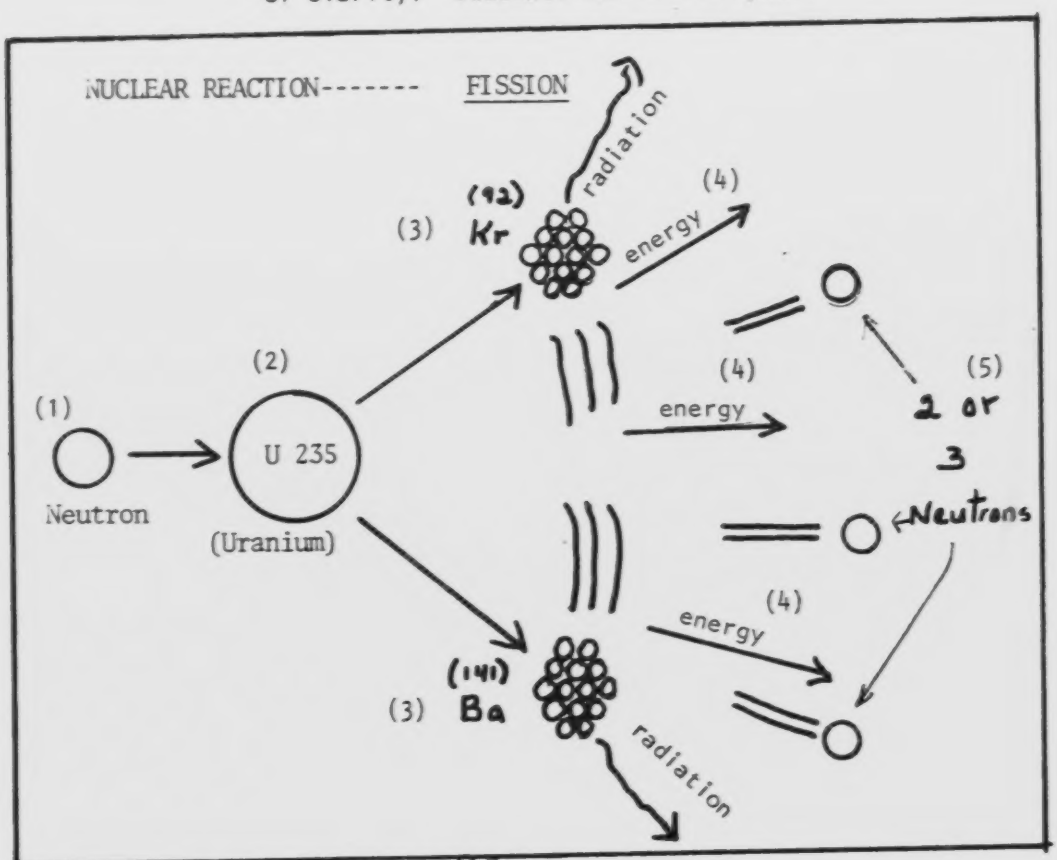
2. Explain to the student the nuclear energy is obtained through nuclear reactions; that in nuclear reactions small amounts of matter are changed into large amounts or energy producing heat, light and radiation. Explain the terms fission and fusion.

   A. Fission - A nuclear reaction in which energy is produced when atoms are split apart (fissioned)

   B. Fusion - A nuclear reaction in which energy is produced when atoms combine (fused)

   Place the following diagrams on the blackboard to explain fission. Give a similar handout to the student which he/she can complete as the reaction is explained (Student Handout I).

Note to teacher: It would be helpful to use colored chalk to color code your diagram for the sake of clarity. Students can use crayons.



Give the following explanation of fission and have the student write it in the appropriate space on his sheet (Student Handout 1)

1. A free neutron
2. Splits the nucleus of the atom of Uranium 235
3. Two new elements (Barium and Krypton) are formed both of which give off radiation
4. Energy is produced (Heat and Gamma Radiation) and
5. Two or three free neutrons are produced

STUDENT HANDOUT I

NUCLEAR REACTION - Fission - Handout I

Definition: _____

_____

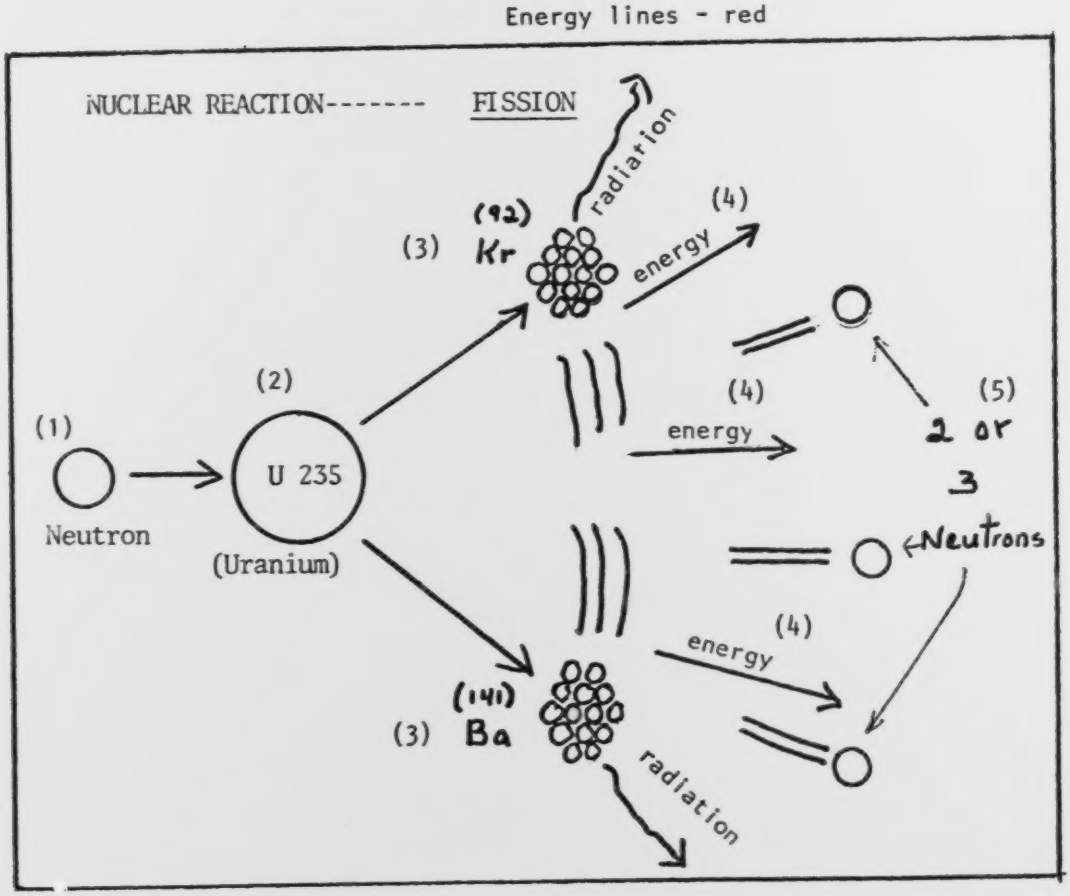
_____

COLOR CODE

Neutrons - green

Radiation lines - orange

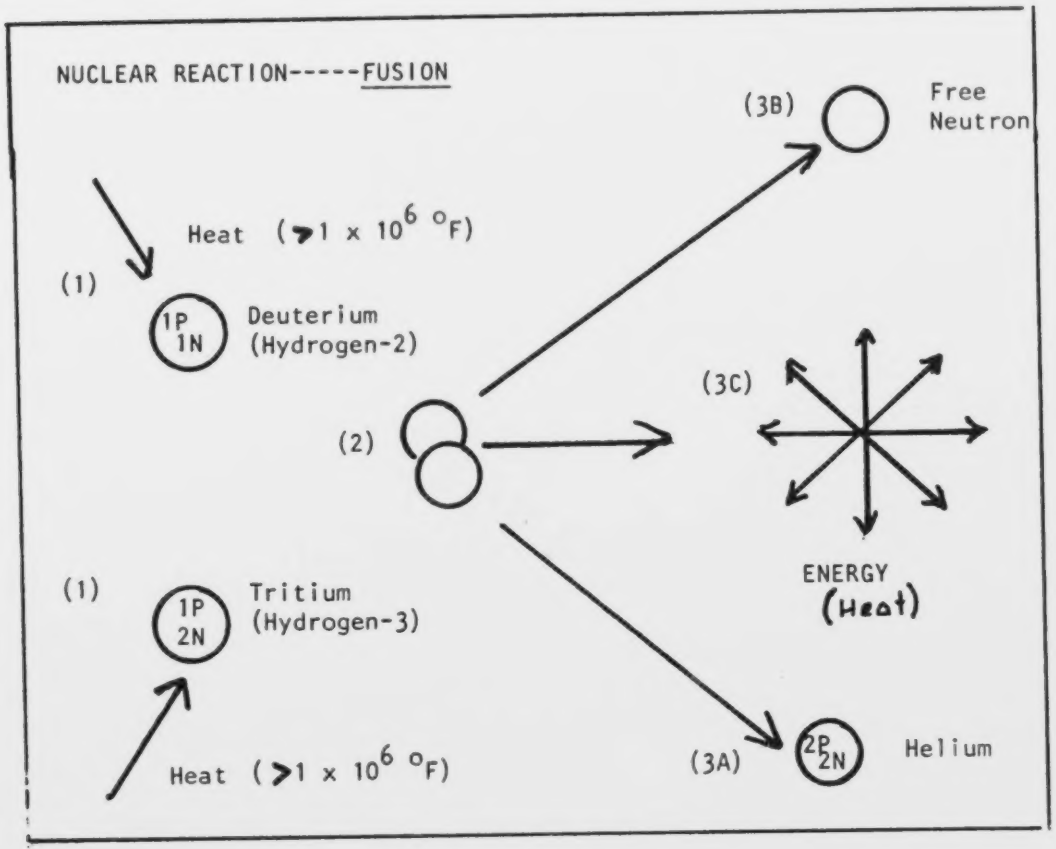
Energy lines - red



Explanation:

1.
2.
3.
4.
5.

3. Place the following diagram on the blackboard to explain FUSION. Give the student a similar Handout (II) which he completes as the reaction is explained.



Give the following explanation of fusion and have the student write the explanation in the appropriate space on his sheet.

a. In this example of fusion, two isotopes of hydrogen (Deuterium & Tritium) are heated to temperatures of millions of degrees.

b. The nuclei of these two elements combine.

c. When they combine:
   3A-Helium is formed
   3B-A free neutron is produced
   3C-Huge amounts of energy are produced

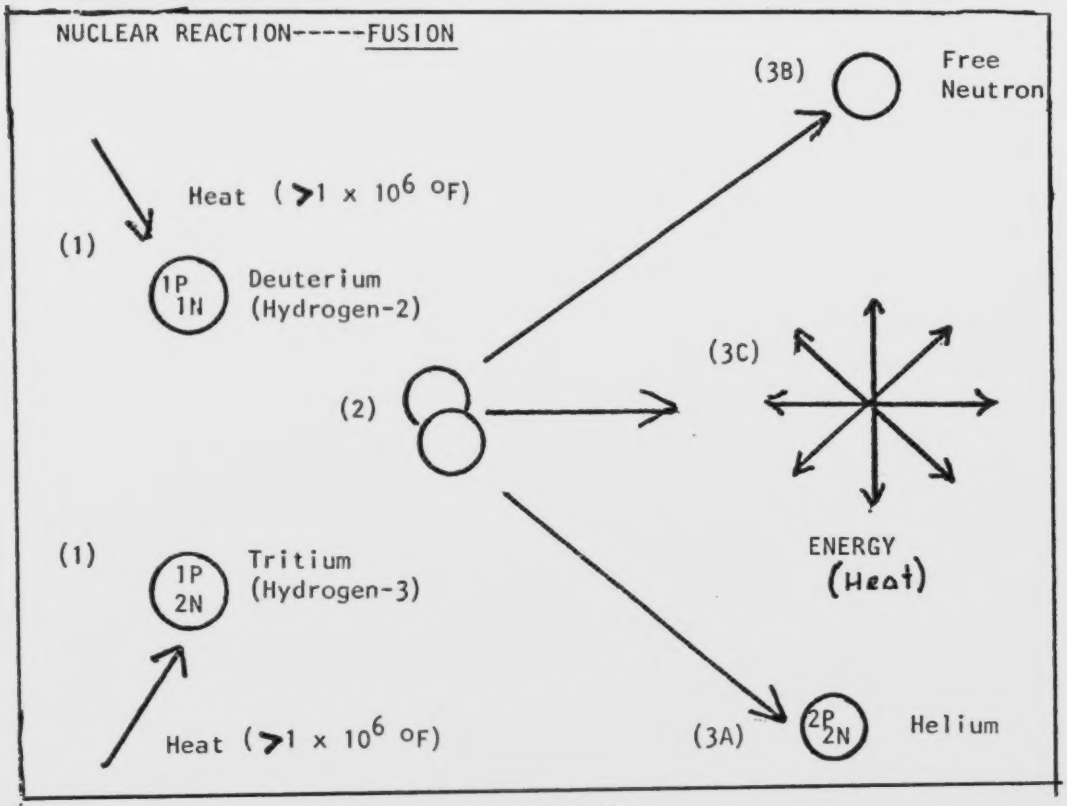
STUDENT HANDOUT

NUCLEAR REACTION - Fusion - Handout II

Definition: _____

_____

_____



Note: For clarity, color code diagram as follows:
Heat Lines - red; Neutrons - green; Energy Lines - yellow, red, orange

Explanation

1.

2.

3.

A.

B.

C.

ASSESSMENT TASKS:

1. Write a brief paragraph which describes how fission produces Nuclear Energy.

2. Write a brief paragraph which describes how fusion produces nuclear energy.

3. Construct two diagrams accompanied by explanation which describe the two reactions which produce nuclear energy.

ISSUE: NUCLEAR ENERGY

LEVEL: 10-12

OBJECTIVE:

NE-2 The students will be able to describe how nuclear energy is converted to electricity in a nuclear power plant.

SKILLS:

MATERIALS NEEDED:

29 marbles, 32 mousetraps, 64 corks
Handouts I & II (from objective 1), cardboard or plywood, periodic table of elements, crayon

ACTIVITIES:

1. Introduce the concept of Chain Reactions
   a. Refer the students to Handouts I & II from Objective 1. Tell them to observe that in each diagram the energy produced is a one time occurrence. State that in order for nuclear reactions to be suitable for large scale production of energy, the reactions must occur continuously. Tell the student that this continuously occuring reaction is called a Chain Reaction.

Note to teacher: The following activity may be in small groups

   b. Demonstrate a Chain Reaction by arranging twenty-eight marbles in a triangle (See Figure 1). Use the extra marble to strike the head of the marble at the tip of the triangle. Repeat this process several times. Conduct a brief classroom discussion using the following questions:

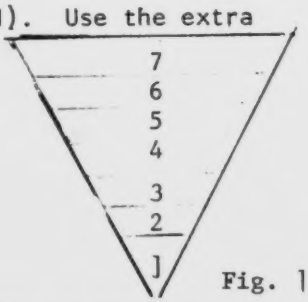


Fig. 1

      1. What happened when the marble at the tip was struck?
      2. What made this reaction occur?

Note to teacher: If the correct answer to question number 2 has not been given, explain how this reaction occurred. Ask the students why the demonstration was an example of a Chain Reaction.

c. Tell the students that the following activity will demonstrate what happens when uranium 235 undergoes fission . . . Carefully set a mousetrap. Drop a cork on the spring bar so that the trap is tripped. (Repeat several times). Refer the students to Handout I from Objective 1 (Fission Reaction). Ask the students the following questions:

1. What structure in the Fission Reaction does the cork represent? (Neutrons)
2. What structure in the Fission Reaction does the mousetrap represent? (^{235}U)
3. What process in the Fission Reaction does tripping the trap with cork represent? (The splitting of ^{235}U)

d. Tell the students that the following activity will demonstrate a chain reaction of the Fission of uranium 235 . . . Place 32 mousetraps in four rows of eight so that they form a square. Each row should be about 1cm apart. Place two corks on the spring bar of each trap and then set the traps carefully. Enclose the entire setup within walls at least 6 inches high (See Figure 2). Carefully trip the first trap and observe what happens. Conduct a classroom discussion using the following questions:

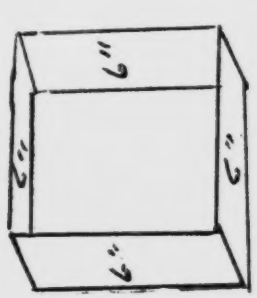


figure 2

1. Was the reaction continuous?
2. What did the corks represent?
3. What did the tripping of the traps with the corks represent?
4. As the traps were tripped did the number of "free" corks increase or decrease?
5. If this were the actual Fission Reaction, would the number of neutrons increase or decrease?
6. What effect would this have on the rate of the nuclear reaction?
7. Why did this activity demonstrate a chain reaction?

Place the following diagram on the blackboard. It illustrates the continuous fission of ^{235}U .(save)

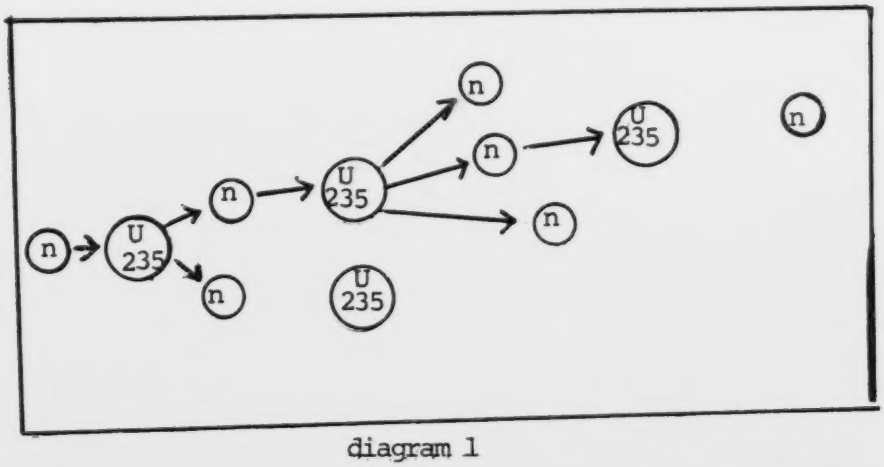


diagram 1

Explain to the students that if these nuclear chain reactions are not controlled, a nuclear explosion may occur (i.e. atomic bomb and hydrogen bomb)

a. The explosion of the atomic bomb - results from an uncontrolled fission reaction.
b. The explosion of the hydrogen bomb results from an uncontrolled fusion reaction.

Hint to teacher: In the cork and mousetrap activity (part d),

1. Spacing between the rows is important if the experiment is to work correctly. You may have to make adjustments.
2. You may wish to make the traps stable by either nailing them in place (use thin nails) or using super glue.
3. The walls may be made of cardboard or plywood or the entire setup can be constructed in a big box.

2. Introduce the concept that nuclear reactors control nuclear reactions.

   a. Refer to the activity with the corks & mousetraps. Ask the students how they could control the number of corks springing the traps?

Note to teacher: You want to arrive at the point where you could reduce the number of corks available to trigger the traps or you could cover some traps to block the reaction.

Explain to the students that a nuclear reactor controls a nuclear reaction by controlling the flow of neutrons and the number of neutrons available for the reaction.

Illustrate this point by drawing shielding around general neutrons in diagram one.

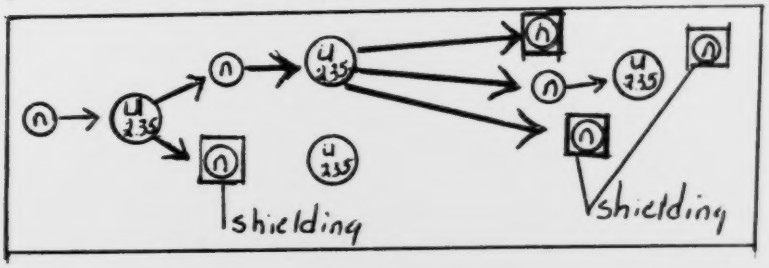


diagram 2

   b. Tell the students that there are many types of nuclear reactors but most have the same basic structures.

Place the following diagram on the blackboard and give students the Handout (Handout III) which they color coded and completed according to the discussion. Discuss the parts of a nuclear reactor and their functions. (You may want to color code your diagram)

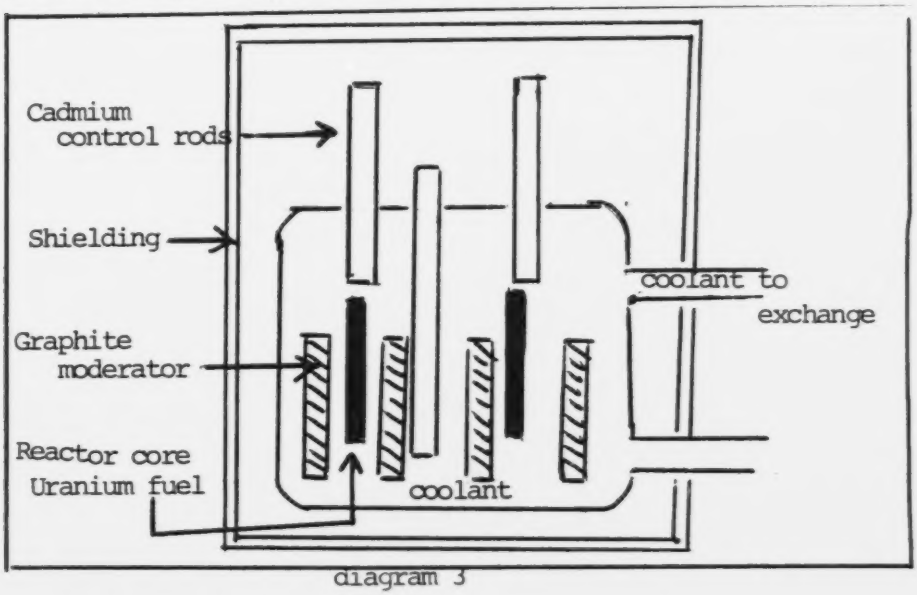


diagram 3

1. Fuel Core - uranium or other fissionable material which is to be used in the nuclear reaction.
2. Control Rods - absorb the neutrons; control the rate of the reaction (speed it up or slow it down).
3. Moderator - graphite or other materials used to slow down the speed of the neutrons.
4. Coolant - liquid (sodium, water, etc.) that absorbs the heat produced by the nuclear reaction and carries it out of the reactor
5. Shielding - thick layer of concrete or lead which absorbs the dangerous gamma radiation.

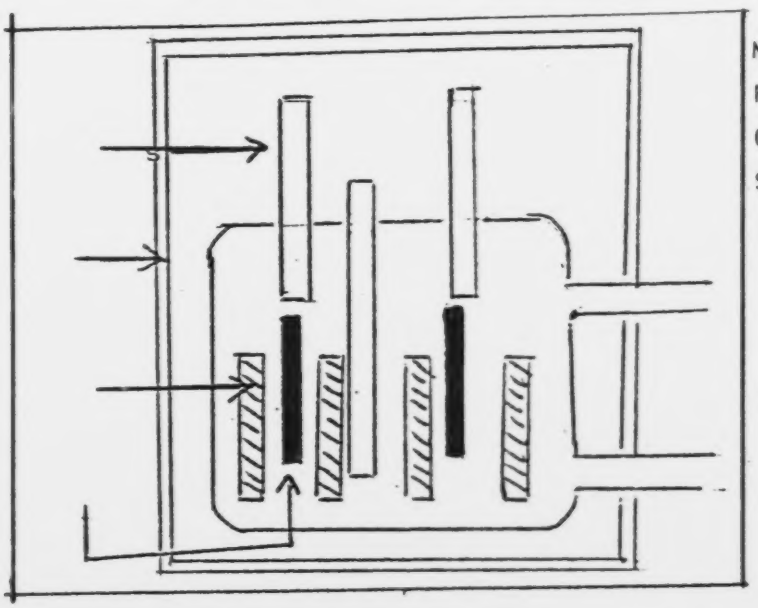
Student Handout III

Parts of the Nuclear Reactor - Handout III purpose of the Nuclear Reactor _____

_____

_____

Directions: Below is a diagram of a Nuclear Reactor. As the teacher discusses the parts and their functions, label and color (according to the color code) the parts and write their functions in the space provided.



Color Code

Modeactor - yellow

Fuel Core - orange

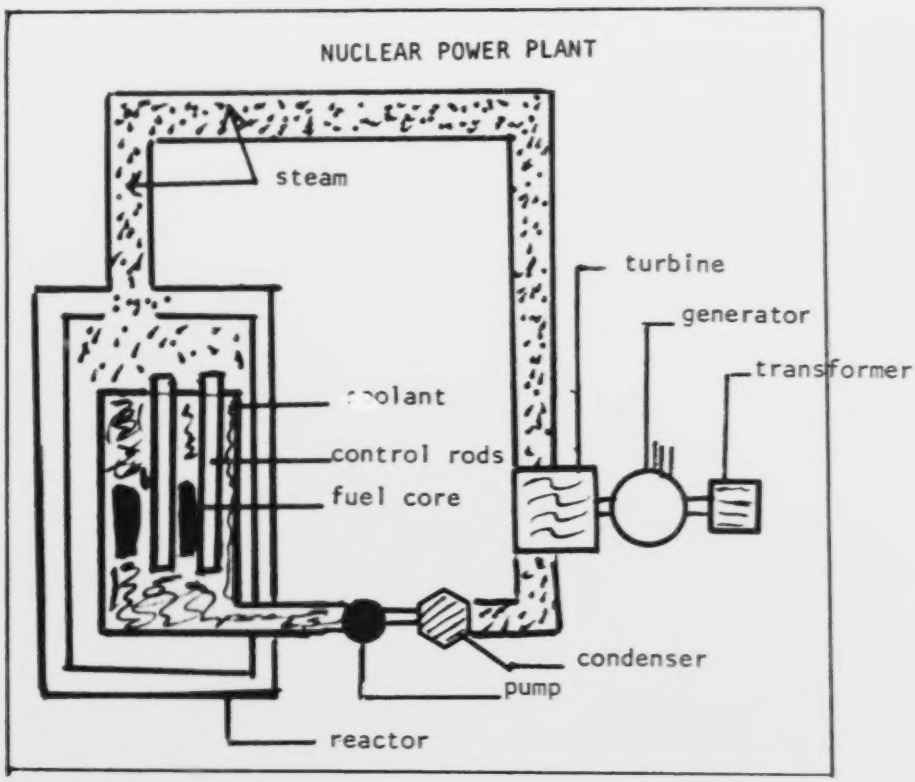
Coolant - light green

Shielding - gray

Give the functions of the following:

- Shielding -
- Fuel Core -
- Control Rods -
- Moderactors -
- Coolant -

3. Develop the concept that if nuclear reactors are part of a power plant, the heat taken away by the coolant is eventually converted into electricity.
   a. Define the roles of a turbine, a generator and a transformer in the production of electrical energy. Use the tea kettle and pin wheel to demonstrate the affect of steam on the turbine. Use a hand-cranked dynamo or bicycle generator to simulate the turbine to generator electricity sequence.
   b. Place the following outline diagram of a nuclear power plant on the blackboard. Label the parts and discuss the process by which nuclear energy is converted to electrical energy in a nuclear power plant. Give the students the worksheet which they are to complete after the discussion. Discuss the answers to make sure all of the students have the correct answers.



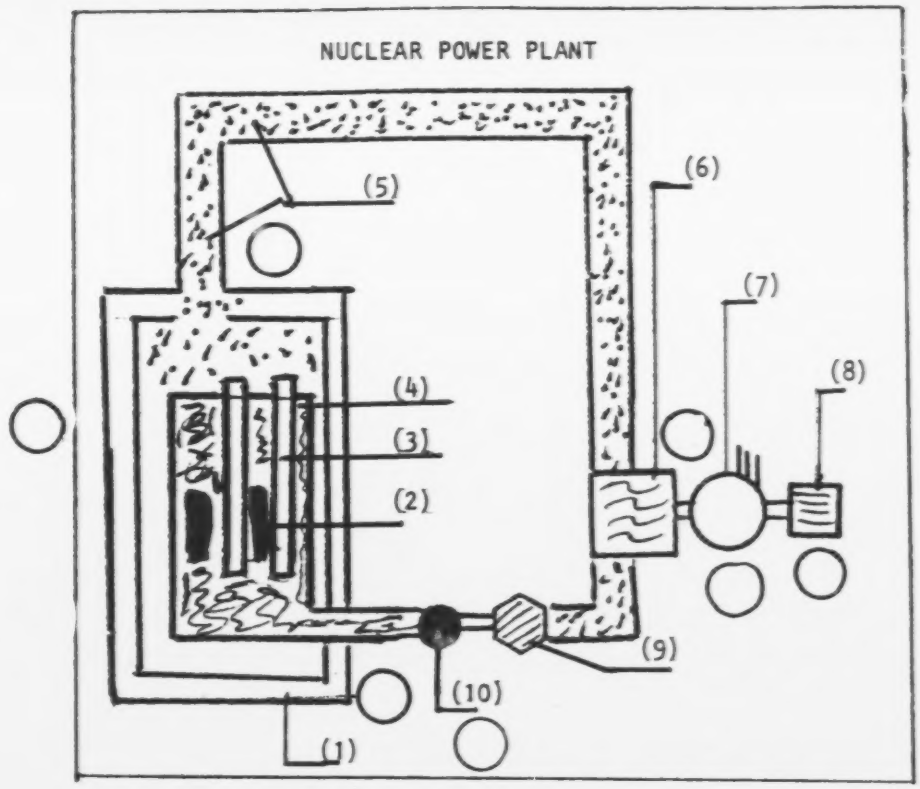
Note to the teacher:

A brief explanation is given for your convenience. In the fission of ^{234}U (fuel core) produces heat. This heat causes some of the coolant (water) to change into steam. The steam produced causes rotary motion in the Turbine. The rotary motion of the turbine is converted to electricity by the generator and the transformer sends the electricity out to the power lines. The steam which turned the turbine is changed back into water by the condenser and the pump sends this water back to the reactor. The amount of energy produced by the power plant will be controlled by the control rods in the reactor. These rods control the output by controlling the rate of the nuclear reaction in the reactor.

ACTIVITY WORKSHEET- ACTIVITY 3B

From Nuclear Energy to Electricity

Part One: The diagram below is an outline diagram of a nuclear power plant. Label correctly the following structures: reactor, fuel core, control rods, coolant, turbine, generator, transformer, condenser, and pump.



Part Two: Below is a list of statements that describe processes which occur when nuclear energy is converted to electrical energy in a nuclear power plant. Each statement is preceded by a circle with an indicated color. Color the circle with the correct color, then find the process being described by the statement in the diagram above and color that circle the same color.

(R) Uranium 235 is being split to produce nuclear energy (in the form of heat).

(Y) Some of the coolant (water) is being converted to steam.

(G) Steam produces rotary motion.

(O) Rotary motion is converted into electricity.

(B) Electricity is sent to power lines.

Blue Purple

Steam is changed to water
Water is returned back to the reactor to begin the cycle again.

ASSESSMENTS:

1. Describe the role that each of the following plays in the process of changing nuclear energy into electricity in a nuclear power plant.
   a. uranium
   b. fission
   c. heat
   d. nuclear reactor
   e. coolant (water)
   f. steam
   g. turbine
   h. generator
   i. transformer
   j. heat exchanger (opt.)
   k. control rods

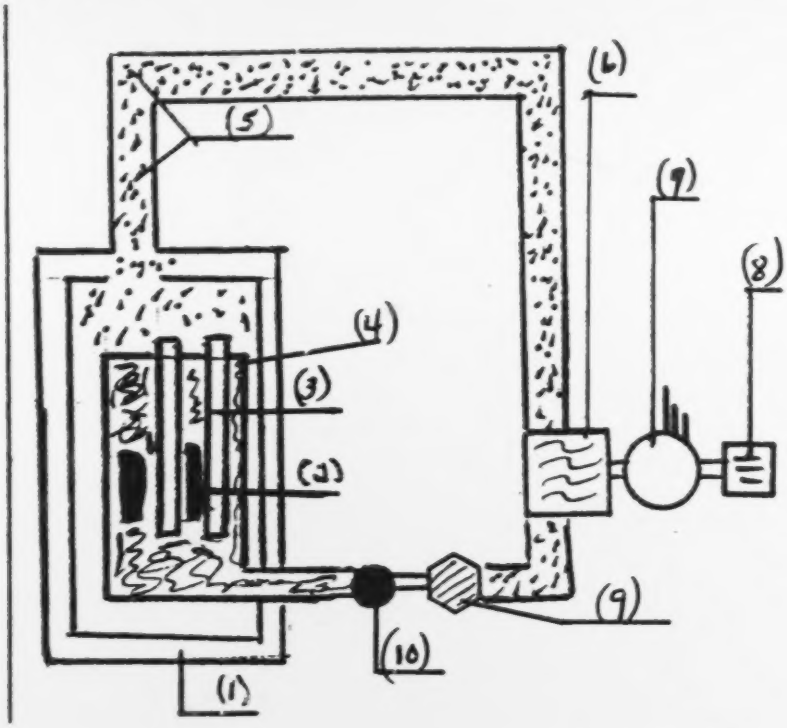
2. Label the parts of the given diagram and describe the role that each part plays in producing electricity from nuclear energy in a nuclear power plant (see next page for diagram).

3. Starting with the fission of uranium 235 and ending with the power lines, briefly describe the process by which nuclear energy is changed into electricity in a nuclear power plant.

ASSESSMENT 2

Name _____ Date _____

Part I - Label the indicated parts of the outline diagram of a nuclear power plant.



Part II - Describe the role that each part plays in producing electrical energy from nuclear energy.

1.
2.
3.
4.
5.
6.
7.
8.
9.
10.

ISSUE: NUCLEAR ENERGY

LEVEL: 10-12

OBJECTIVE:

NE-3 Students will describe at least four major types of possible risks associated with the use of nuclear power plants.

SKILLS: Collecting data, Interpreting data

MATERIALS NEEDED:

-Physical Science Textbooks

-Geiger Counter (available on loan from Civil Defense Service)

-Weak Source of Radiation (available from Civil Defense Service)

-A Map of the United States

-Reference information on the Calvert Cliffs Nuclear Power Plant

-Classroom Set of the Pamphlets

"Q and A-Nuclear Power and the Environment" available from Nuclear Environmental Services - 3 Choke Cherry Road, Rockville, Maryland 20850, Phone: (301) 977-4480

-The World Almanac-Book of Facts

ACTIVITIES:

RISK 1: Exposure to radiation from a radioactive material.

1. Lead a discussion to define the vocabulary terms: radiation, alpha particles, beta particles, and gamma rays. Explain the penetrating power of each form of radiation.
2. Use a Geiger counter to demonstrate to the students what happens when a radiation source is encountered.
3. Discuss the various standard measures of exposure to nuclear radiation. Define the terms: roentgen, rad, millirem, curie, and picocurie. Point out that the average radiation dose that most persons are subject to in a year, from the environment and from visits to the doctor or dentist (x-rays), is not harmful. Have them research and discuss the harmful effects of radiation on living cells, tissues, organs, systems, and organisms (plants and animals).

RISK 2: Leakage of radiation from the nuclear reactor.

1. Have students refer to their drawing of a nuclear reactor (from Objective 2) and identify places where leaks could occur. Example: a crack in the pipes that lead from the reactor to the turbine.

2. Discuss ways that have been established to prevent or safeguard against leaks in the nuclear reactor. Example: the concrete encasement or shield around the rods.

RISK 3: Disposal of Nuclear Waste

Teacher-Student Discussion:

1. Have students answer the following questions (a) "What are nuclear wastes?" (Nuclear wastes are new radioactive materials that are created as a result of nuclear fission). (b) At the present time, the U.S. government has no plan for the permanent disposal of high level nuclear waste, therefore, "What is now done with nuclear wastes from the nuclear power plants?" (The nulcear wastes are now transported from the nuclear power plants and temporarily stored in containment tanks in various areas around the U.S. that are buried on land or sunk under water).

2. Discuss with the students this question: "What problem arises from the storage of nuclear wastes?" (The nuclear wastes are very radioactive and therefore potentially dangerous; they may take hundreds of years to decay enough to become harmless. Therefore the storage and disposal of nuclear wastes is a long range situation).

3. Introduce the concept of half-life using Iodine 131 as an example (some I-131 in gaseous form escaped from 3-Mile Island). Have students work through an I-131 decay of a 64 gram amount for a period of two months, using the approximate half-life period for I-131 of 8 days. Graph the resulting data.

RISK 4: Physical distance of the nuclear power plant to populated areas.

1. Using a map of the U.S. and provided references (such as The World Almanac), have the students locate and mark the Nuclear Power Plants found in this country. Questions for discussion: (a) "In what section of the U.S. do you find most of the nuclear power plants?" (The eastern section of the U.S.). (b) "Why do you think more nuclear power plants are located in this section?" (Because this section of the U.S. is densely populated, the communities need a greater supply of energy. The old sources of energy (fossil fuels) are dwindling, thus new sources such as nuclear energy are needed to keep up with the increased demand).

2. Using a map and pictures, show the class that the Calvert Cliffs Nuclear Power Plant is about fifty miles from D.C. Assign the students the task of finding out how dangerous it is to live in D.C. with a nuclear power plant so close. Encourage the use of periodicals describing the Three Mile Island accident and a pamphlet: "Q and A, Nuclear Power and the Environment." (See materials)

RISK 5: Thermal pollution of the aquatic environment.

1. Conduct a discussion to explain to the class that most nuclear power plants, using light-water reactors, are built near waterways, due to the need for water to circulate through the nuclear reactor to transfer heat. The run-off water from the condenser in the nuclear power plant can raise the water temperature of a nearby waterway several degrees. This causes "thermal pollution". Thermal pollution is the contamination of the environment caused by the release of an abnormal amount of heat. Have the class find out the harmful effects a rise in temperature can have on the organisms living in an aquatic environment, For example, (a) Algae growing in the river could be killed by the warmer water. (b) Fish feeding on this algae could die out because of the reduced food supply.

2. Have students investigate (using provided references) what nuclear power plants are doing to correct the thermal pollution of our waterways. For example, closed-cycle cooling systems will cool the condenser water from the nuclear power plant and return it to the plant for reuse.

RISK 6: Nuclear Melt-Down.

1. Have students investigate (using provided references) what happens to the nuclear reactor during a melt-down. For example, the reactor core overheats and the rods melt.

2. Identify three risks involved in a nuclear melt-down. For example, the rate of the nuclear chain reaction would be uncontrolled, if the control rods melt, thus causing an explosion.

Concluding Activity:

Summary of Risks from Nuclear Materials:

Have students make a list of the following hazards of handling nuclear fuel: mining the ore; processing U-238 to make fuel rods; shipping the fuel rods; disposing of spent fuel rods and associated wastes; possible leaks from the reactor itself of the spent fuel storage tanks (the U.S. Congress has still not authorized a permanent disposal site/sites). Students should do research on how each of the above steps in the nuclear fuel cycle is handled. Encourage students to offer alternate handling procedures and justify the benefits of their own methods over existing procedures.

ASSESSMENT TASKS:

1. Construct a chart listing, (a) four types of risks associated with the generation of nuclear power, (b) a brief description of the risks involved, and (c) a means to control the risks.

2. Construct a worse-case scenario of what would happen if a melt-down occurred at Calvert Cliffs. Write a few concise sentences which describe the probable sequence of events which would occur.

3. Construct a paragraph giving your opinion on whether we should continue to build nuclear plants, considering the risks involved, to make electricity as a substitute for our dwindling fossil fuel reserves.

ISSUE: NUCLEAR ENERGY

LEVEL: 10-12

OBJECTIVE:

NE-4 Students will describe at least four constructive uses of nuclear energy in today's society.

SKILLS: Collecting data
Communication

MATERIALS NEEDED:

Physical Science Textbook

Physics Textbook

Michelsohn, David Reuben, Atomic Energy for Human Needs, New York, Julian Messner, 1973

ACTIVITIES:

1. Have students collect information (using provided references) concerning the constructive uses of nuclear energy produced by nuclear reactors in today's society. For example: nuclear energy used to power ships, submarines and spacecraft.

2. Have students collect information (using provided references) concerning the constructive uses of the radiation set free by nuclear reactors. For example, the following radioisotopes are helpful in research, medicine and industry:

   Research - Carbon 14 - measuring the age of fossils

   Medicine - Phosphorus 32 - diagnosis and treatment of bone cancer

   Industry - Radioactive Iron - incorporated with steel to measure the wearing away of machinery

3. Have students share their findings orally with their classmates by means of a news forum.

ASSESSMENT TASKS:

1. Construct a paragraph to explain the use of radioisotopes. in the area of medicine.

2. Write a short essay describing the use of nuclear energy to power submarines and ships.

3. Give two examples of how radioisotopes are used in industry.

ISSUE: NUCLEAR ENERGY

LEVEL: 10-12

OBJECTIVE:

NE-5 Given the information and experiences incorporated in this unit, the student will construct a project which describes how the local community feels about using nuclear energy as a power source. This presentation may be in the form of a written or oral report with graphs and charts.

SKILLS: Communicating, Collecting data, Interpreting data

MATERIALS:

-References used in the previous objectives
-Activities and Assessments used in the previous objectives
-Survey questionnaire developed by the class
-Tally Sheets on which to record the collected answers

ACTIVITIES:

1. Have the class construct a survey questionnaire that will find out how the community feels about using nuclear energy as a power source. Ask questions that are directly related to opinions on this issue. Divide the class into small groups to work on necessary tasks such as: typing the

questionnaire, selecting the number of people to be surveyed, proof-reading the questionnaire, and distributing the questionnaires to each student.

2. After the class has decided on the final draft of the questionnaire, each student is given about ten copies to pass out to people in the community. The student is responsible for making certain that each questionnaire is answered completely and that all ten are returned to the teacher.

3. When each student has collected the questionnaires, the answers should be recorded, by each person, on a Tally Sheet. This Tally Sheet is used to help the student compile the data and thus give a description of how each small community feels about using nuclear energy as a power source. The students can now analyze the information and prepare a project in the form of a written report with graphs and or charts that can be orally presented to the class. These presentations could also be given for another science class, sent to ward representatives to give them the communities' opinions on nuclear energy, or sent to the D.C. congressional representative. They might also be displayed in a local store or church. Be sure to follow proper procedures for arranging for permission to display the project.

ASSESSMENT TASKS:

1. Write a brief essay describing your community's feelings about using nuclear energy as a power source.

2. Construct a graph, illustrating the community's answer to one of the questions on your tallied survey sheet. Describe your results in a paragraph.

3. Construct a chart, showing the community's responses to five of the questions on your tallied survey sheet. Describe your findings in a paragraph.

Note: This assessment is known as "product" assessment. Each student would be expected to do only one of the above suggested projects.

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RESOURCE MANAGEMENT

SCIENCE AND SOCIAL ISSUES

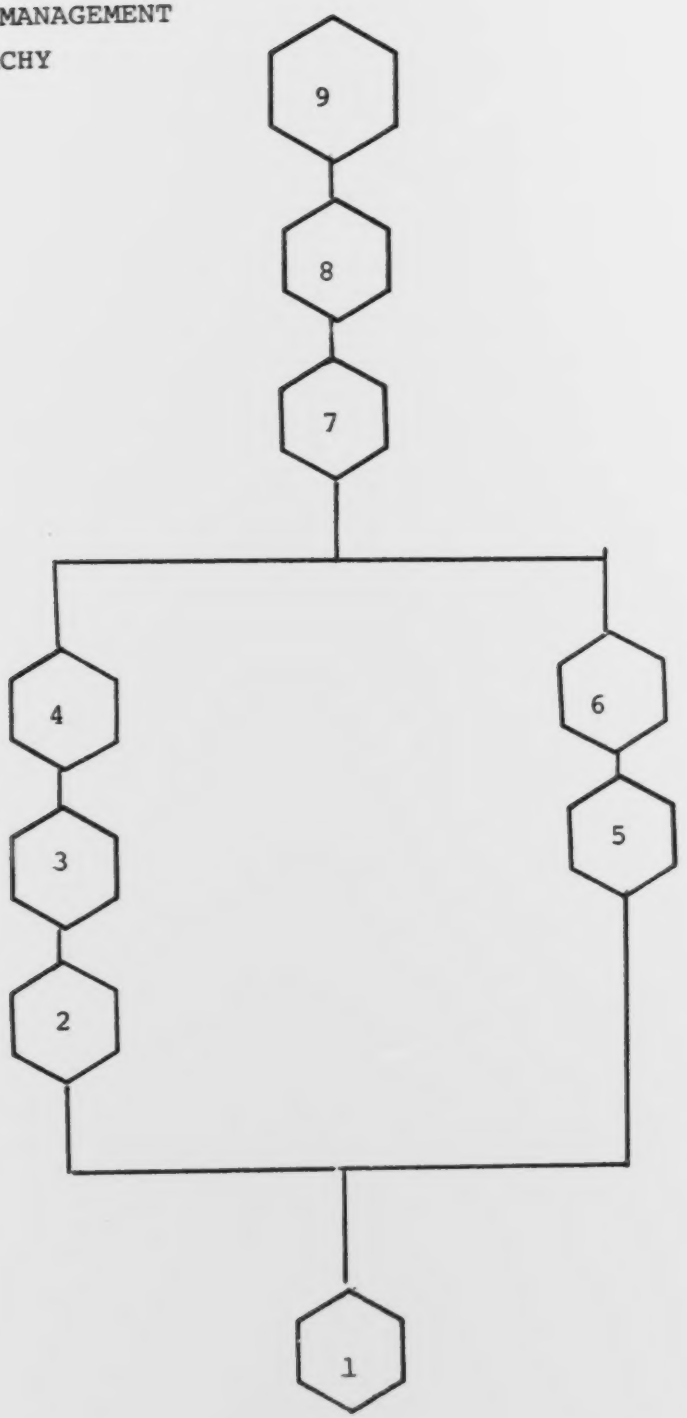
ISSUE: RESOURCE MANAGEMENT

RATIONALE

A vast range of power sources are available for man's use today, and more are likely to be harnessed during our lifetimes. Important choices need to be made about which of theses sources should be developed. World oil reserves are rapidly being depleted and alternatives must be examined now.

In the course of this issue students will be exposed to data and techniques designed to allow them to take part in this decision making process when they become tomorrow's citizens and voters.

RESOURCE MANAGEMENT
HIERARCHY



RESOURCE MANAGEMENT

Students will be able to:

1. Construct hypotheses about methods they could utilize to conserve some of their daily energy consumption.
2. Describe an interrelationship between the sun, the earth's water cycle, plant life, and the three common forms of energy (coal, hydroelectricity, and petroleum/gas).
3. Form and defend a hypothesis about which forms of energy are likely to be the most desirable for future use, given circle graphs on energy consumption and energy reserves.
4. Describe the costs and benefits of three sources of energy- coal, oil/gas, and hydroelectricity- as a way of making value judgements about each energy form.
5. Describe geothermal energy in terms of its source, the types that reach the earth's surface, how it is used by man, and the problems that accompany its use.
6. Describe solar energy in terms of its possibilities for use as an energy source for man's needs.
7. Construct a feasibility study on the use of photosynthesis as an energy source.
8. Construct an advertising campaign designed to convince the American public that more development funds should be spent on OTEC (Ocean Thermal Energy Conversion).
9. Construct and defend a presentation advocating one particular source of energy which they believe merits additional governmental encouragement, be it through regulation or funding.

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-1 Students will construct hypotheses about methods they could utilize to conserve some of their daily energy consumption.

SKILLS: Constructing hypotheses, Collecting data

ACTIVITIES:

1. The teacher will assist students in conducting a research activity aimed at dramatizing the energy they personally use, while increasing their personal research skills. Free response will be used to get project outline started. Ask questions such as "What kind of energy are you consuming right now?" Let students compute their percentage of the light, and their percentage of the heat being used in the classroom. Expand the discussion to transportation; their percentage of the bus or subway cost on a given trip. Usage at home will also be investigated. What appliances are used, for what amount of time? How much hot water? Students will be instructed to check, where possible for wattage and make their own calculation. Designated students will be asked to get information for the entire class such as utility costs for the school, price per mile on metro, or the price of home heating oil. Finding utility costs at home can be the individual's responsibility. When the research is completed, have them do an energy consumption inventory sheet.

2. Students will construct a hypothesis on how they could save 20% of the energy they now use and test their hypothesis by such experiments as going through a day of walking to school, taking a shorter shower, or leaving some lights out. Discussions in class can be based on student's energy saving experiences.

ASSESSMENT TASKS:

1. Construct an hypothesis about changes which could be made in your school to cut down the amount of energy use by 20%.
2. Construct an hypothesis on how your life would be affected if you were forced to reduce your personal energy consumption by 50%.
3. Construct an hypothesis about what would happen if the government should decree that each family must decrease the use of household electricity by twenty percent.

SCIENCE AND SOCIAL ISSUES

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-2 Each student will describe an interrelationship between the sun, the earth's water cycle, plant life, and the three common forms of energy. (coal, hydroelectricity, and petroleum/gas)

SKILLS: Communicating, Using flow charts

MATERIALS:

A chapter to read from any of several junior high science texts, which explains the conversion of solar energy stored in coal, water, and petroleum products.

ACTIVITIES:

1. Have students construct a flow chart drawing a lightbulb on one end and the sun on the other. Students will be told that they are going to start from the electricity in the lightbulb and trace its origin back to the sun. Thru discussion, the students will construct an electricity flow chart showing the following steps: the socket, the wiring, the meter, the utility poles, the high tension lines, the generator, the turbine, the dam sluice, the river, the runoff, the rain, the evaporation from the ocean, and the sun. Concepts of electricity conversion and generation should be included in this chart.

    a. Have the students investigate the processess involved in the water cycle. Define and discuss the following proccesses.

        (1) evaporation (2) condensation

        (3) precipitation (4) transpiration

2. As a second activity, divide the students into two groups and give the following assignment:

   Group I - The local electric power company uses coal to generate electricity. Draw a flow chart to show how the electricity in this case really came from the sun, just as hydroelectricity does. Hint: Find out how coal is formed in the earth.

   Group II - The local electric power company uses fuel oil to generate electricity. Draw a flow chart to show how the electricity in this case really came from the sun, just as hydroelectric power does. Hint: Find out how petroleum/gas is formed in the earth.

   At an appropriate time while the students are working on their tasks, conduct the following demonstration:

   Show each student a wooden match and ask:

   1. Of what is this match made? (wood)
   2. When it burns what kind of energy is given off? (heat and light)
   3. Where did this energy come from? (The wood was made by a tree through photosynthesis)

ASSESSMENT TASKS:

1. Describe the interrelationship between the sun, water flowing into a river and trees along the river bank in connection with the water cycle. (precipitation, condensation and transpiration)

2. Describe how the motion of flowing water can be harnessed to generate electricity. Answer should include the use of a dam and waterwheel (turbine) and the conversion of motion to electricity by a generator.

3. Construct a flow chart explaining how electric light can come from sunlight through a transition involving coal or oil.

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-3 Given circle graphs on Energy Consumption and Energy Reserves, students will form and defend a hypothesis about which forms of energy are likely to be the most desirable for future use.

SKILLS: Interpreting Data, Constructing hypotheses

ACTIVITIES:

1. Students will be asked to contruct circle graphs on the following 1977 information or later data which may be available to the teacher:

	1977 Energy Consumption	U.S. Energy Reserves
Coal	18.8%	81.7%
Nuclear	3.5%	
Natural Gas	25.9%	3.5%
Domestic Oil	24.3%	3.4%
Imported Oil	24.3%	3.4%
Oil Shale		7.2%
Uranium		4.2%
Hydroelectric	3.2%	

2. Students will be asked to examine their charts and give free responses on their interpretation of the data. During this discussion the teacher will insure that the following points are brought out: we are heavily dependent on imported oil, and we have very little reserve of anything but coal.

ASSESSMENT TASKS:

1. Construct a hypothesis about why coal company stocks will rise in value in the stock market.
2. Construct and justify a hypothesis about which of our energy reserves should receive the most commercial development as a future energy source.
3. Construct a hypothesis on the future use and importance of the conversion of coal to gas and oil (liquid coal).

SCIENCE AND SOCIAL ISSUES

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-4 Given three sources of energy - coal, oil/gas, and hydroelectricity, describe the costs and benefits as a way of making value judgments about each energy form.

SKILLS: Communicating, classifying, hypothesizing.

MATERIALS:

Sunny Side of Energy, the Atlantic Richfield Company, Consumer Affairs Department

Perspectives on Energy; Ruedisili, Lon C., ed., Oxford Press, NY, 1978

Energy, Environment, Mini-Unit Guide National Science Teachers Association, Washington, D.C. 1975

The Economic Viability if Synthetic Fuels From Coal; Bagge, Carl E., World Coal Conference, London, 1975

The Energy Answer; National Coal Association, Washington, D.C. 1978

Coal Fuels; National Coal Association, Washington, D.C. 1975

Coal and Environment; National Coal Association, Washington, D.C. 1979

Coal: Liquefaction; U.S. Department of Energy, Division of Coal Conversion, Quarterly Report/April-June 1978, Publication Date: January 1979

ACTIVITIES:

1. Student will construct or design a three - dimensional model or a series of drawings, illustrations, and diagrams - that show:
   - a strip coal mine.
   - sulfuric acid leaks into a water supply of a nearby city.
   - a method for reducing sulfuric acid leaks.
   - a water treatment plant.
   - dead fish and barren soil near the coal mine leak.
   - a railroad that ships coal to the city.
   - an abandoned mine and town that was forced to vacate because the mine company depleted the seam of coal.
   - a former strip mine that was turned into a recreation and nature park.
2. Have students independently read three different stories - one showing the business advantage of oil/gas exploration and hydroelectric dam-building, one presenting the environmental problems associated with those activities, and one considering both the business and environmental impacts of changing the landscape to build dams or explore for oil/gas.

After the student reads about these subjects, have each one write an essay which concisely describes the environmental/business impacts and a statement on whether oil/gas and hydroelectricity are environmentally safe and cheap enough to harness for power.

ASSESSMENT TASKS:

1. Write an outline of what three characteristics you would consider important in determining the environmental impact of a strip mine.
2. Write an outline of what characteristics you would consider important in determining the environmental impact of a dam construction plan.
3. Write a two page essay concisely stating which natural resource extraction is the most beneficial, economically and environmentally. State your reasons. For help, refer to DM5 & 6.

SCIENCE AND SOCIAL ISSUES

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-5 Given instruction on geothermal energy and the geothermal activity in the earth's structure, the student will describe geothermal energy in terms of its source, the types that reach the earth's surface, how it is used by man and the problems that accompany its use.

SKILLS: Observing, Communicating

MATERIALS:

-- Tootsie roll pops (one for each student)
-- Percolator coffee pot with stem and basket

ACTIVITIES:

1. Review the composition and formation of the earth's crust with the students. Then have them do the following simulations:

   a. Pass out a tootsie roll pop, wrapped, to to each student. Have them rap on the desk with the wrapped pop; have them wrap very hard, trying to break the pop. Then have them make comparisons with earth's mantle and magma noting that the core of the earth is estimated to have a temperature of 3,500 to 4,500°C., but that this energy is hard to use on the surface.

b. Using a percolator, do the following demonstration.
Fill the percolator half full of water, plug it in but leave out the stem. Through simulation lead students to realize that the hot water would not get to the surface (represented by the coffee grounds if they could be in place without the stem).

Repeat the activity, but this time add the stem. Does the water reach the coffee grounds? Explain that a passageway to the surface (coffee grounds) is necessary to make the system useful; the passageway through the earth is the fissures along fault lines in the earth's crust.

2. Ask the students what to expect if a little water were placed on a very hot surface. Lead them to conclude that either hot water or steam, such as at Yellowstone, might be produced. Use this to lead into the next activity.
Have them use their text materials and references (Challenges to Science: General Science by McGraw Hill is an excellent source) to research geothermal energy and energy leaks.
Be sure that the discussion that follows covers all types of leaks--geysers, hot springs; also discuss geothermal wells, hot steam and hot rocks as sources of geothermal energy. Include the composition of each source of energy and how it reaches the surface of the earth.
Have them find ways in which man uses this energy.

The uses should include the following:
-hot springs....therapeutic purposes (healing)
-geothermal wells.. sources of hot water for uses in # 3.
-dry steam.....piped directly into turbines to generate electricity
-dry hot rocks...experimentation is underway to devise methods to tap this energy source for use by man.

3. Have students determine, from research, how geothermal hot water can be used. Some examples of its use are as follows:

-can be piped directly through buildings and used for space heating--as in such cities as Klamath Falls, Oregon, Boise, Idaho and in the capital city (Reykjavik) of Iceland.
-is also used in Iceland to warm greenhouses.

-can be used to generate electricity; a liquid chemical with a low boiling point is heated to boiling with the geothermal hot water. The chemical changes to a gas and the gas turns the turbines that produce electricity. (Arrive at this use through making parallels with conventional generators).

4. Have students discuss any problems with the use of geothermal energy that they have encountered in the research.

Be sure to include the following:

-corrosion caused by the minerals dissolved in the hot water as they run through the turbines;
-geographic inaccessibility to most of the people (in U.S., most sites are in the western part of the country).

-pollution..sites that produce a mixture of steam and hot water also bring polluting substances out of the earth--dissolved minerals, sulfur chemicals such as hydrogen sulfide (rotten egg smell), and sulfur oxides that can damage the lungs if inhaled.

-loss of energy due to transporting it over long distances, and sites are usually f- from towns.

ASSESSMENT TASKS:

1. Describe how geothermal energy is formed within the earth.

2. Choose two of the following types of geothermal energy sources and describe ways in which man adapts them for his energy uses.

   a. geyser
   b. hot springs
   c. geothermal wells
   d. dry hot steam
   e. Hot rocks

3. Discuss any problems that are encounterd with the use of geothermal energy. Be sure to include at least two.

265

SOCIAL ISSUES

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-6 The student will be able to describe solar energy in terms of its possibilities for use as an energy source for man's needs.

Skill: Measuring, Communicating, Predicting

MATERIALS:

- four to six test tube racks containing 5 test tubes each
- aluminum foil, flat black electrical tape
- white tape
- four to six thermometers
- plastic or glass convex lens
- references containing information on use of solar energy, solar heating house plans, etc.

suggestions:

Energy: Past. Present, Future, D.C. P.S.
Challenges to Science: General Science, McGraw Hill

ACTIVITIES:

1. Pass out to students small magnifying lens and show them how to concentrate the sun's rays to a point hot enough to ignite paper. Let them identify the source of the heat.

   Explain that this technique can be used on camping trips to start fires.

a. If the day is very bright and sunny, pass out the test tube racks and have them partially fill each tube with cold water. Cover each set of test tubes as follows: one with tin foil, one with black electrical tape, one with white tape and the last, no tape, (leave open). After 15 to 20 minutes, record the temperatures of the water in each of the tubes.

Have them compare the differences in temperatures. The tube covered with the black tape should show the higher reading. This demonstrates a scientific principle that is important in solar heating systems.. dark colors absorb more light than lighter colors. That absorbed light is transformed into heat.
Have them apply this principle to their style of dress in summer and winter.

b. Review with the students the greenhouse effect. This is the heating effect that results when sunlight is absorbed by materials inside a closed container and then changed into heat energy.
A closed car on a hot day builds up heat inside due to the greenhouse effect. Sunlight passes through the windows, is absorbed by materials inside, and is transformed into heat. The sun warms the upholstery and other materials in the car, and they in turn warm the air, The air gets warmer and warmer, and cannot escape. The heat is trapped. Why do we refrain from closing small children and pets up in cars in summer?

2. Divide the class into 4 groups. Assign each group one of the following topics to research and report on to the class:

   a. Passive solar heating system
   b. Active solar heating system and its three subsystems
   c. Installation of solar heating systems in new homes vs existing buildings
   d. Efficiency of solar energy heating; its advantages and disadvantages

   The Terraset School in McLean, Virginia and The Providence Baptist Church, in Baltimore, MD. are examples of new constructions with solar heating systems. In Georgetown, there are homes that have added solar heating to existing facilities. These can be utilized as sources for field trips, as a class or individually.

3. Have students research and discuss possibilities for future uses of solar energy such as the following:

   a. Producing electricity
      -sequential conversion
        ..flat plate electrical generator
        ..solar power tower
        ..concentrators
        ..collectors

      -direct conversion
        ..photovoltaic cells

   b. Cooking with solar energy

4. The use of solar energy for space heating and the production of electricity has gained increasing numbers of advocates in the United States. The government and the private sector are pouring money into research to explore possibilities for its efficient use.
   Based upon information from the class discussions and readings, have students discuss the following statements:

   a. Solar energy is a fast moving field; what is considered a viable use of solar energy today may be passé tomorrow.

   b. Some of the material on solar energy in the textbook is no longer valid; it is outdated and the text is only three years old.

5. Ask the students to make predictions about the use of solar energy in terms of how widespread its use will be in the future as a space heating source in American homes.

268

ASSESSMENT TASKS:

1. Describe the greenhouse effect and how it relates to the use of solar energy as a source of heat for man.

2. Choose one of the following concepts of solar energy and explain what it is and how it works.

   -passive heating system
   -active heating system
   -sequential conversion
   -solar power tower

3. Discuss the efficiency of solar energy as a source of heat. Explain the advantages and disadvantages.

SCIENCE AND SOCIAL ISSUES

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-7 Students will construct a feasibility study on the use of photosynthesis as an energy source.

SKILLS: Collecting data, Communicating in writing

MATERIALS:

-- Energy, Environment and the Economy, Table 184, for lesson 8, from "Energy From Nuclear Fission". (Draft), 1975.

-- "Energy - Environment Source Book," by John W. Fowler, National Science Teachers Association, 1975. 1742 Connecticut Avenue, N.W., Washington, D.C. 20009, pp. 206-207.

ACTIVITIES:

1. Help students to review the process of photosynthesis as a way of deriving power from the sun and the historical use of this energy through wood-fired steam engines. Make the connection between wood-burning steam generators and coal burning electrical generators. Give the students data on a plan for the growing of trees to produce fuel for a generating plant. Ask them to write a short feasibility study on the plan. The study should include such factors as:
    a. Costs
    b. Availability of wood
    c. Environmental Impact
    d. Efficiency of wood as a fuel

Data is available on p. 207 of Energy Environment Source Book, NSTA, 1975, 1742 Connecticut Avenue, N.W., Washington, D.C. 20009.

2. Have students discuss the costs and the benefits of the use of photosynthesis as an energy resource, following the guidelines of solving a social problem from Unit I, Decision-Making, Objective 6. Have students role play as a farmer, a scientist, an economist and as an attorney to understand who benefits from photosynthesis as an energy source. The student may also participate in a debate, with the teacher serving as moderator, and the non-debating students as debate evaluators.

ASSESSMENT TASKS:

1. Write at least three correct questions which need to be asked when constructing a feasibility study of the use of photosynthesis as an energy resource.
2. Construct the outline for a feasibility study on wood-burning engines.
3. Outline a feasibility study on using gasahol as an automobile fuel.

SCIENCE AND SOCIAL ISSUES

ISSUE: RESOURCE MANAGEMENT

LEVEL: 10-12

OBJECTIVE:

RM-8 Student will construct an advertising campaign designed to convince the American public that more development funds should be spent on OTEC. (Ocean Thermal Energy Conversion)

SKILLS: Collecting data, Communicating

MATERIALS: References

-- "Solar Sea Power," Clarence Zener, Physics Today 26: 48-53, January 1973.

-- "Energy from the Sea," Parts I, II and III, Popular Science, May, June, July, 1975.

-- "Ocean Thermal Energy Conversion," Robert Cohen (pp. 218-220) in Energy and Man: Technical and Social Aspects of Energy, M. Granger Morton, editor (New York: IEEE Press) 1975.

-- Energy Under the Ocean: A technology Assessment, Don E. Rash, et. al. (Norman, Oklahoma: University of Oklahoma Press) 1973.

-- "Power, Fresh Water and Food from the Sea," Harry Davitian and William McLean, Science 184: 938, May 31, 1974.

-- Fact Sheet No. 6-Nat'l Science Teachers Assn. "Solar Sea Power."

-- "Lava" lamp - available at novelty shops like Spencer's - The base is filled with liquids of different densities, which shift and flow as a decorative display.

272

ACTIVITIES:

1. Turn on a "lava lamp", and ask students to write their observation of what happens. Concepts of convection currents and comparative densities can be explained. Hot air balloons and ice floating on water are useful examples. In the discussion, note that in lava lamps electrical power is changed to heat which is then converted into motion. Students will be asked how that motion could be converted back to electricity. The point will be made that a turbine and generator could turn the motion back to electricity. The teacher will ask where these conditions might be found in nature. A chart of the ocean currents of the world will be shown. Students will be shown a sketch of an OTEC unit and teacher will explain its function. The point will be made that the sun is the source of ocean currents.

2. Hold a class discussion on the implications of OTEC as an energy source of the future. Be sure that the following points are covered and supply specific data as needed: environmental impact, cost of construction, transportation of energy, storage of energy, cost of energy produced, need for governmental intervention, use of international waters. Following the discussion, students will construct a paragraph or poster advocating development of OTEC.

ASSESSMENT TASKS:

1. Construct a sketch of an OTEC unit and explain its function, in terms of why the ocean is a good source of energy.
2. Construct a convincing argument for OTEC, based on the fact that all continents are surrounded by oceans.
3. Construct a convincing argument for OTEC, based on the costs of using the ocean as an energy source.

SCIENCE AND SOCIAL ISSUES

ISSUE: Resource Management

LEVEL: 10-12

OBJECTIVE:

RM-9 Students will construct and defend a presentation advocating one particular source of energy which they believe merits additional governmental encouragement, be it through regulation or funding.

SKILLS: Integrating data, Communicating

MATERIALS:

-- cost vs. benefits chart

RATIONALE:

This objective is designed as a review lesson for the issues on nuclear energy, value judgement, and resource management. It is hoped that students will acquire a heightened social awareness of the importance of energy decision-making, and that they will develop the talents and self confidence needed to involve themselves in this process as future participants in the democratic system.

ACTIVITIES:

1. Help students develop a master list of sources of energy. A class discussion of the relative benefits of each source will be held to identify individuals likely to be effective advocates of particular energy sources as being worthy of increased federal encouragement. From this nucleus, the class will be divided into lobbyist groups.

Insure that each source of energy studied has a group, and that to the extent possible each student is placed in a group whose position he favors. One group will be reserved to serve as the Senate Energy Committee, and another as concerned environmentalists.

Once this organization is established, the teacher will assign each lobbyist group the task of researching and organizing data supportive of the concept that the chosen source of energy is the one most deserving of governmental assistance. The Senate Energy Committee group will be charged with developing criteria to be used in evaluating the lobbyist groups' presentations and the environmentalists will develop data on which energy sources have the least environmental impact.

2. After sufficient supervised research and discussion, divide the class and arrange the classroom as a Senate Committee hearing room. Have students role play the positions described above. Expect all participants to maintain a chart of energy sources, listing benefits and costs, as they are brought out in debate and testimony.

3. Following the preceding instructional activity which used a Senate Committee debate, each student will be elevated to the rank of senator and develop his personal position on a national energy policy. A floor debate will then be held, allowing each student to give input into which energy resources should be given governmental impetus.

ASSESSMENT TASKS:

1. Student will write an essay entitled "If I were a senator I would promote the following laws on energy conservation."
2. Student will write a composition entitled "If I were a senator I would encourage research on the following energy source:
3. Prepare an advocacy presentation as if you were a lobbyist for one of the energy sources.
4. Write a list of 5 resolutions for yourself on what action you plan to take as a citizen to influence the government to stimulate certain forms of energy and give your reasons for each.

COSTS VS BENEFITS CHART FOR SOURCES OF ENERGY

SOURCE	AVAILABILITY TODAY	AVAILABILITY IN 50 years	TODAY'S NEED FOR IMPORTS	DO WE HAVE TECHNOLOGY?	ADDITIONAL TECHNOLOGY NEEDED	ENVIRONMENTAL IMPACT	CURES FOR ENVIRONMENTAL IMPACT	COST	REMARKS

-LIST OF REFERENCES FOR RESOURCE MANAGEMENT UNIT-

Strip Mining

Appalachian Region - "Great Strip Mine Flood," Nation, 6/4/77

Florida -" . . . Phosphate Digging in Polk Co." U.S. News, 5/23/77

Ky.- "Making Moonscapes for Coal" Progressive 2/77

W. Va. - "After the Floods; Tug Valley, W. Va." Progressive 12/77

West - "Spectre of an American Wastelands; with Editorial Comment" Horticulture 8/77

Md. - "Satellite Monitors Md. strip mines" Space World, 11/76

Montana - "Defending the Land; By Industry vs. Montana Ranchers Over Strip Mining Issue." New Repub. 11/20/76

Pa. - "Healing the Wounded Earth" Sports Illustrated, 9/20/76

West - "Strip Mining of Western Coal", Sci. Am. 5/76

Dam Building

"Bungles, Blunders, Botches; Orme Dam Proposal" National Parks and Conservation Magazine, 10/76

"Dam Safety" Audubon, 11/76

"Power to Dam the New River." Nation, 8/14/76

"Ruckus Over A Scenic River . . ." U.S. News, 8/23/76

"Day the Teton Dam Broke" Readers' Digest, 1/77

"Teton Dam Collapse . . ." Science, 7/2/76

"Teton: Eyewitness to Disaster," Time 6/21/76

"Bitter Battle of the Waterways" Readers' Digest, 9/77

Dam Building (cont.)

"Georgia Dam Collapse Renews Concern for Safety," Science 11/25/77

"Disasters at a Necessary Part of Benefit Cost Analyser" Science 9/16/77

"Those Uninspected Dams: Like a Loaded Shotgun" U.S. News 11/21/77

Note: U.S. News and World Report magazine may well be the single most accessible source for current data on energy and resources on a weekly basis. Check the school library to find out if a subscription to this magazine is already in existence.

SUPPLEMENTARY ACTIVITIES - FILMS

The following films are recommended as supplemental activities.

(001) A is for Atom. Nontechnical description of atoms and nuclear reactor. 15 min.

(508) Challenge of The Future. An important overview of the range of energy choices. 29 min.

(526) Coal The Other Energy. Discusses the "new coal age" conversion to gas and oil, and environmental impact. 15 min.

(514) Don't Cut Us Off. Case studies of high energy costs affecting the poor.

(507) Energy - The American Experience. Historical introduction to the use of energy and a peek at future sources. 28 min.

(527) Energy Update. President Carter and others detail our energy quandry. 28 min.

(552) Fusion: The Ultimate Fire. Describe the efforts to enter the "age of inexhaustible energy". 15 min.

(519) Gothermal - Natures Boiler. Quick survey of field in U.S. 7 min.

(524) The Great Energy Freeze. Shows how deeply our lives were affected by severe winter of 1977 with implication for the future. 27 min.

(499) Here Comes the Sun. In-class tour of solar heated buildings.

(447) Nuclear Power and The Environment. Discusses corrective steps taken for all forms of nuclear pollution. 14 min.

(501) Power From The Earth. Describes several geothermal techniques.

(531) Running on Empty. Uses a fuel economy road rally to demonstrate driving habits which conserve fuel. 27 min.

(510) The Solar Generation. Survey ranging from Archimedes' use of sun to burn enemy ships through today's use of solar cells.

(509) The Ultimate Energy. Visits to five fusion research laboratories. 28 min.

(515) Up The Power Curve. Focuses on conservation efforts we can use at home and how important they are in the energy crisis. 10 min.

All films are available from:

DOE Film Library
P.O. Box 62
Oak Ridge, TN 37830

Further information is available by a local call to the Motion Picture Officer at DOE (202) 973-3596.

APPENDIX

GLOSSARY OF TERMS *

Action Words

The following terms are used to designate observable behaviors which, when exhibited by students, give evidence that the requested tasks have been successfully performed.

1. Name	To specify what an object, event, or relationship is called.
2. Identify	To select a named or described object by pointing to it, touching it, or picking it up.
3. State a Rule	To communicate, verbally or in writing, a relationship or principle that could be used to solve a problem or perform a task.
4. Order	To arrange three or more objects or events in a sequence based upon a stated property.
5. Distinguish	To select an object or an event from two or more which might be confused.
6. Describe	To state observable properties sufficient to identify an object, event, or relationship.
7. Demonstrate	To perform a sequence of operations necessary to carry out a procedure.
8. Construct	To make a physical object, a drawing, or a written or verbal statement (such as an inference, hypothesis, or a test of any of these).
9. Apply a Rule	To derive an answer to a problem by using a stated relationship or principle.

* The definitions for action words and the processes of science are quoted, with permission, from Guide for Inservice Instruction, Science.. A Process Approach Program, published by the American Association for the Advancement of Science, Miscellaneous Publication 67-9, Washington, D.C., 1967.

PROCESSES (SKILLS) OF SCIENCE

In science a strong emphasis is placed on developing the ability of students to employ the processes of science to learn about the natural phenomena around them. These same processes are used by scientists in pursuing their own investigations. Many of the processes are useful in other areas of study and in everyday life.

Students develop facility with the basic processes in early grades, and move on to the more complex integrated processes in grades four through nine. The laboratory science courses in senior high school synthesize the use of all of the processes into a set of investigative skills which can be used in the life-long pursuit of solutions to problems.

Basic Processes

1. Observing- Using several or all of the senses... sight, touch, hearing, taste, and smell... to find out about an object. (Note: Unknown objects should not be tasted.) Quantitative (measured) observations are more precise than qualitative observations.
2. Inferring- Making an interpretation of an observation. If it is observed that a pond is frozen, then we infer that the water temperature is below 0^{o} degrees Celsius.
3. Using Space/Time Relationships- Being able to describe the physical environment in terms of spatial relationships and changes with time. This includes symmetry, motion, rate of change in position, direction of change in position, and the measuring of time intervals.
4. Measuring- Choosing an appropriate measuring instrument, using it properly, recording the readings and carrying out calculations with the resulting data.
5. Communicating- To transfer information to someone else by means of oral and written words, diagrams, maps, graphs, mathematical equations, and visual demonstrations.
6. Classifying- To impose order on collections of objects or events. Biologists classify living things as plants or animals. Classification systems are used in everyday life for filing systems, telephone listings, classified ads, and personal activities such as shopping lists.
7. Predicting- Making a specific forecast of what future observations are likely to be. Predictions are based on observations and inferences already made. For this reason, they are different from making a guess.

INTEGRATED PROCESSES

1. Formulating Hypotheses- Hypotheses are statements of generalizations that include all objects or events of the same class. They are always based on observations or inferences. It is observed that a dog sheds hair in the spring of the year, the generalization might be that all hair-covered animals shed in the spring. This generalization (hypothysis) could be tested by observing as many other animals as possible.

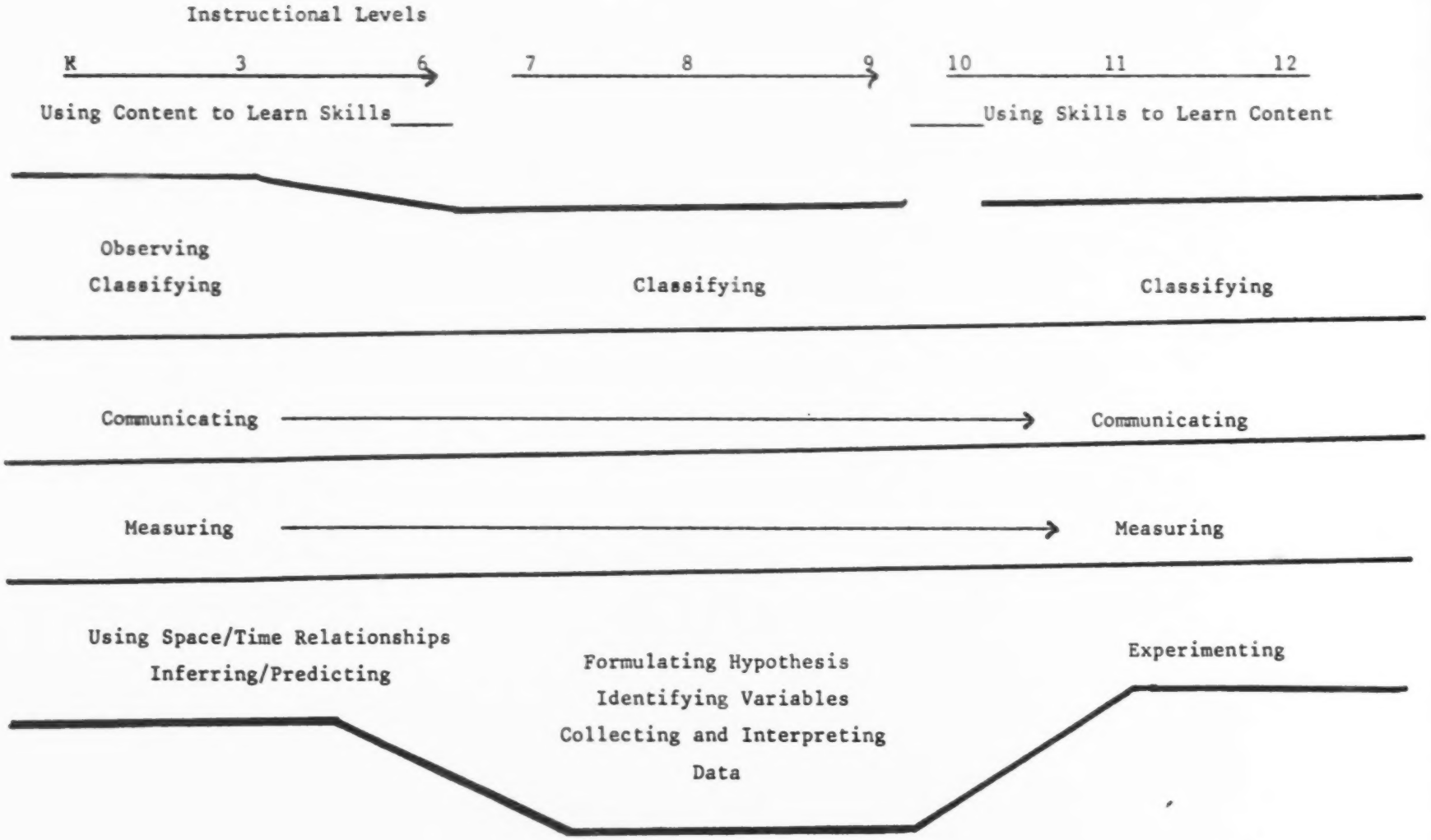
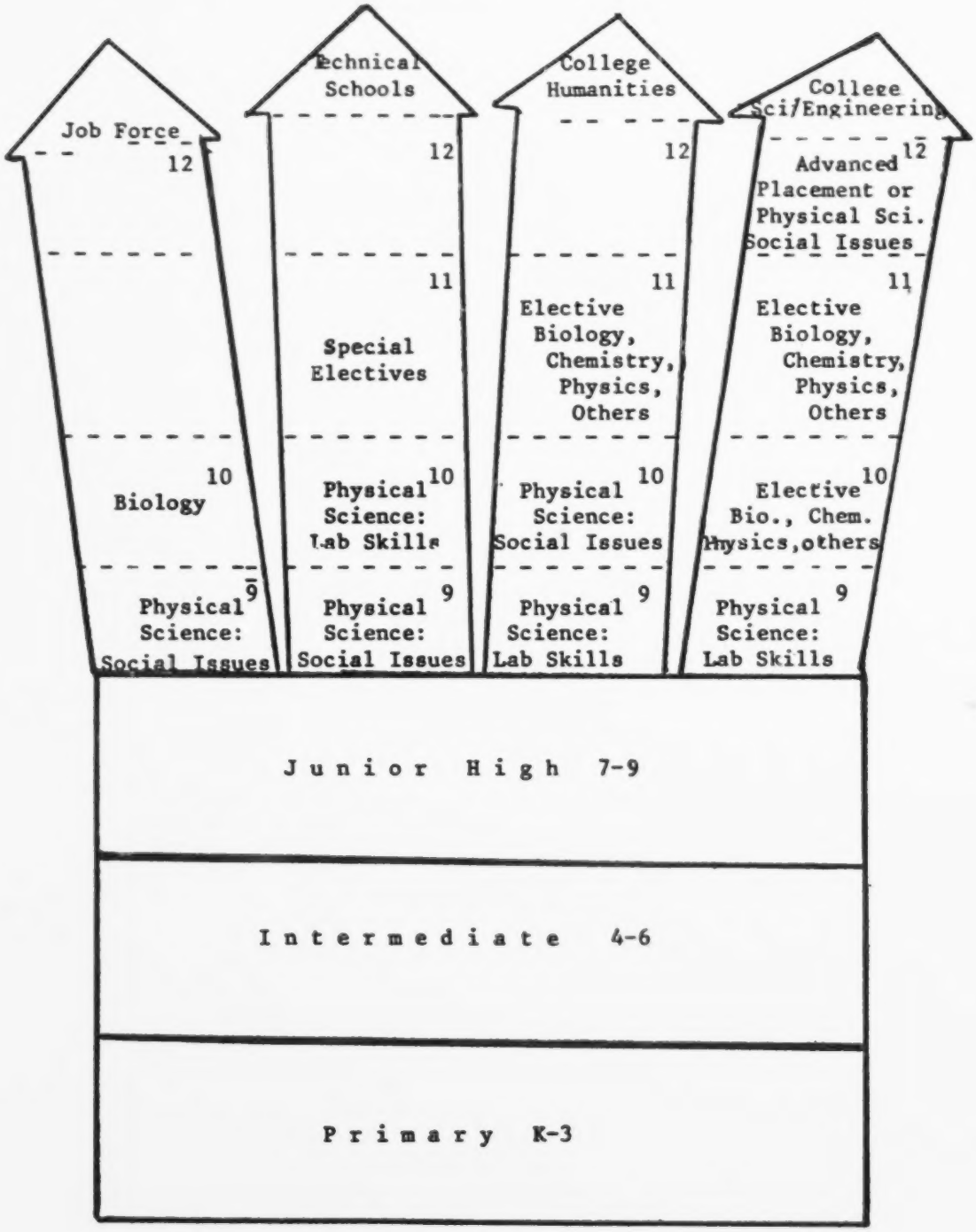
2. Controlling Variables- When scientists conduct investigations ot test hypotheses, they first identify al the variables they can and then design a procedure to control each variable. To get good evidence they manipulate in an orderly way, the variable stated in the hypothesis and watch for corresponding changes in another variable called the responding variable. All other variables are held constant in so far as is possible.

3. Collecting and Interpreting Data- This is a process useful in nearly all activities. The reading of books, newspapers, charts, graphs, maps, and pictures requires us to interpret. The attempt to find the meaning in data, in whatever form we collect it, leads to the construction of inferences, predictions, and hypotheses.

4. Defining Operationally- To state the meaning of a term in the context of one's own experience. The definition should state "what you do" and "what you observe" in the physical sciences. In Life Science, the definitions are usually descriptive. These definitions are more useful to scientists and children than those in the dictionary. To define "mouse" as the tiny grey animal with fur and beady eyes that crawls through a hole in the wall may be more useful to childern than saying that it is a small member of the genue Mus in the rodent family.

5. Experimenting - This is the cumulative process that includes all the other processes. To do an experiment it is necessary to make some observations, formulate a hypothesis, identify the variables which are present, decide which one is to be manipulated, and interpret the data, and decide whether the hypothesis is to be supported or rejected.

C B C SKILL DEVELOPMENT IN SCIENCE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